Issued May 1969

SOIL SURVEY

Allen County Indiana

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
PURDUE AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1953–61. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1961. This survey was made cooperatively by the Soil Conservation Service and the Purdue Agricultural Experiment Station; it is part of the technical assistance furnished to the Allen County Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in appraising the suitability of tracts of land for agriculture, industry, and recreation.

Locating Soils

All of the soils of Allen County are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. It lists all of the soils of the county in alphabetic order by map symbol. It shows the capability unit, woodland group, and shrub suitability group each soil is in and the pages where the soils and capability units are described.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes other than cultivated crops and woodland can be developed by using the soil map and information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils in the soil descriptions and in the sections "Management by Capability Units," "Woodland," and "Wildlife."

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers and sportsmen can find information of interest in the section "Wildlife."

Engineers and builders will find under "Engineering Uses of the Soils," tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

Scientists and others can read about how the soils were formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Allen County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts About the County."

Cover Picture

Some cropland and some woodland in Allen County have been diverted to superhighways and residential developments. The soils are Morley and Blount.

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SOIL SURVEY OF ALLEN COUNTY, INDIANA

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE PURDUE AGRICULTURAL EXPERIMENT STATION

ALLEN COUNTY is in the northeastern part of Indiana (fig. 1). It has a land area of 429,440 acres. Fort Wayne is the county seat.

In 1960 about 323,000 acres were farmed. Of this, about 234,000 acres were cropped. Corn, soybeans, and wheat are the most important crops. Much of the area has poor natural drainage and needs extensive systems of artificial drainage. Centered around Fort Wayne is much diversified industry, which provides stable employment for a large number of people.

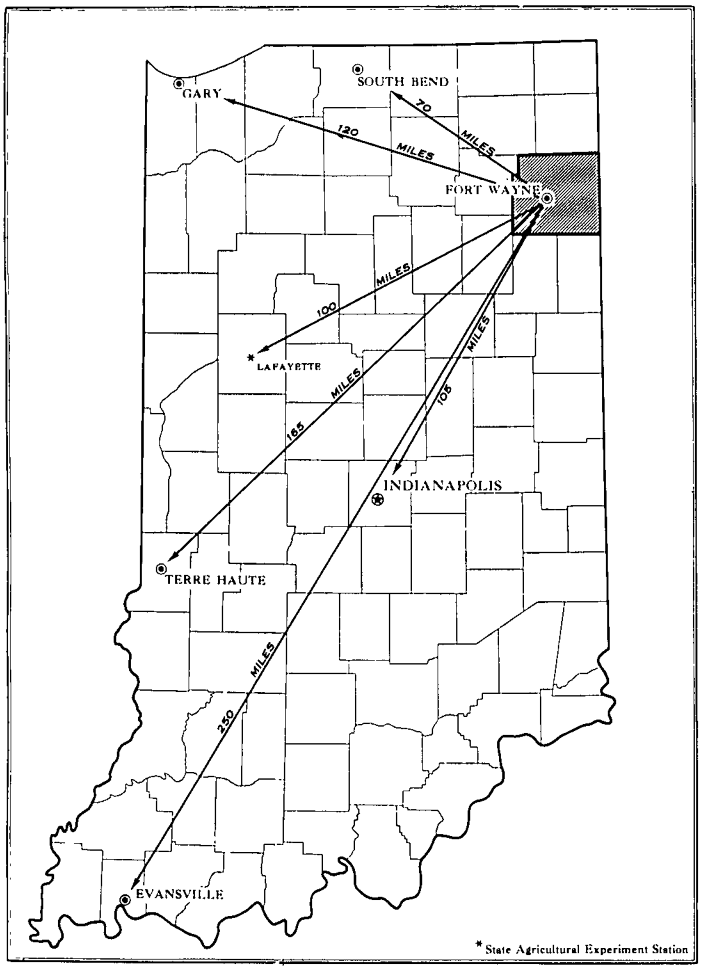

Figure 1.—Location of Allen County in Indiana.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Allen County, where they are located, and how they can be used. They went into the county knowing they were likely to find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Morley and Blount, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the natural, undisturbed landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in the texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a

series, all the soils having a surface layer of the same texture belong to one soil type. Blount silt loam and Blount loam are two soil types in the Blount series. The difference in the texture of their surface layers is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into soil phases. The name of a soil phase indicates a feature that affects management. For example, Blount silt loam, 2 to 6 percent slopes, is one of three phases of Blount silt loam, a soil type that has a slope range of 0 to 6 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that greatly help in drawing boundaries accurately. The soil map in the back of this publication was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed, or occur in such small individual tracts, that it is not practical to show them separately on the map. They show such a mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example Mermill complex.

Also, most surveys include areas in which the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on the soil map like other mapping units but are given descriptive names, such as Gravel pits or Made land, and are called land types.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of readers, among them farmers, ranchers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in the soil survey. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

The general soil map at the back of this publication shows, in color, the soil associations in Allen County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, texture, drainage, and other characteristics that affect management.

The eight soil associations in Allen County are described in this section. More detailed information about the individual soils in each association can be obtained by studying the detailed map and by reading the section "Descriptions of the Soils."

1. Eel-Martinsville-Genesee association

Deep, well drained and moderately well drained, nearly level to moderately sloping, medium-textured and moderately fine textured soils on bottom lands and stream terraces

This association consists of narrow bottom lands and fairly wide stream terraces. Eel and Genesee soils are on the bottom lands, and Martinsville soils are on the stream terraces (fig. 2). Eel soils make up about 45 percent of the acreage, Martinsville soils about 45 percent, and Genesee soils about 10 percent. The association occupies about 4 percent of the county.

Eel soils are nearly level and are moderately well drained. They have a surface layer of dark grayish-brown loam or silt loam, underlain mostly by dark yellowish-brown, mottled silty clay loam.

Martinsville soils are nearly level to moderately sloping and are well drained. They have a surface layer of dark grayish-brown and grayish-brown loam or silt loam and a subsoil that is mostly yellowish-brown and reddish-brown sandy clay loam.

Genesee soils are nearly level and are well drained. They have a surface layer of dark grayish-brown loam to silty clay loam underlain by dark yellowish-brown and yellowish-brown loam.

The soils in this association are well suited to meadow and to corn, soybeans, and small grain. Occasional flooding on the Eel and Genesee soils may destroy or severely damage small grain. The Martinsville soils are subject to erosion.

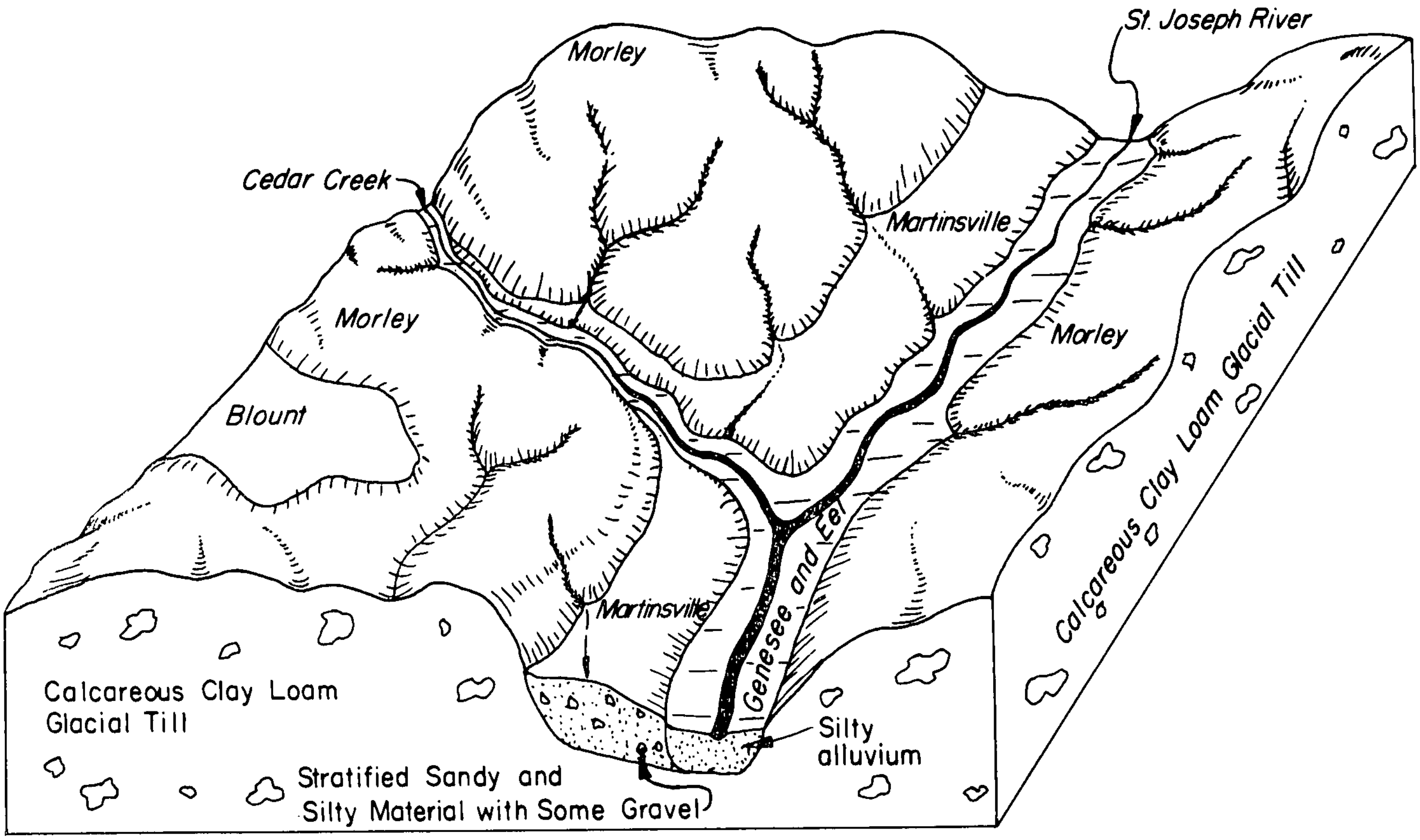

Figure 2.—**Parent material and position of soils in associations 1 and 4 in the north-central part of the county.**

2. *Martinsville-Belmore-Fox association*

Deep, well-drained, nearly level to moderately sloping, medium-textured and moderately coarse textured soils on stream terraces and beach ridges

This association consists of stream terraces and beach ridges. Martinsville and Fox soils are on the stream terraces, and Belmore soils are on the beach ridges. Martinsville soils make up about 40 percent of the acreage, Belmore soils about 20 percent, and Fox soils about 15 percent. Small areas of Chelsea soils, which are excessively drained, Rensselaer soils, which are very poorly drained, and Whitaker soils, which are somewhat poorly drained, make up the remaining 25 percent. This association occupies about 3 percent of the county.

Martinsville soils are nearly level to moderately sloping. They have a surface layer of dark grayish-brown and grayish-brown loam or silt loam and a subsoil that is mostly yellowish-brown and reddish-brown sandy clay loam.

Belmore soils are nearly level and gently sloping. They have a surface layer of dark grayish-brown fine sandy loam or loam and a subsoil that is mostly dark-brown or strong-brown gravelly sandy clay loam, underlain by sand and gravel stratified with lenses of silt and clay.

Fox soils are nearly level to moderately sloping. They have a surface layer of dark grayish-brown loam over brown to yellowish-brown loam and a subsoil that is mostly brown and reddish-brown gravelly clay loam underlain by sand and gravel.

The soils in this association are used for meadow and for corn, soybeans, and small grain. Droughtiness is a limitation in years when rainfall is poorly distributed or below normal, and erosion is a hazard where the slope is more than 2 percent.

3. *Blount-Pewamo association*

Deep, somewhat poorly drained to very poorly drained, nearly level and gently sloping, medium-textured and moderately fine textured soils on uplands

This association is widely distributed on the upland areas but not on the Lake Maumee Plain. Blount soils make up about 40 percent of the acreage, and Pewamo soils about 40 percent (fig. 3). Morley and other soils make up the remaining 20 percent. This association occupies about 26 percent of the county.

Blount soils are nearly level and gently sloping and are somewhat poorly drained. They have a surface layer of very dark grayish-brown and dark grayish-brown loam or silt loam and a subsoil that is mostly dark-brown and dark grayish-brown, mottled silty clay and clay.

Pewamo soils are in slight depressions and are very poorly drained. They have a surface layer of very dark gray silty clay loam or mucky silty clay loam and a subsoil that is mostly dark-gray or grayish-brown, mottled silty clay or silty clay loam.

If drained, the soils in this association are used for meadow and for corn, soybeans, and small grain. Wetness is the major limitation.

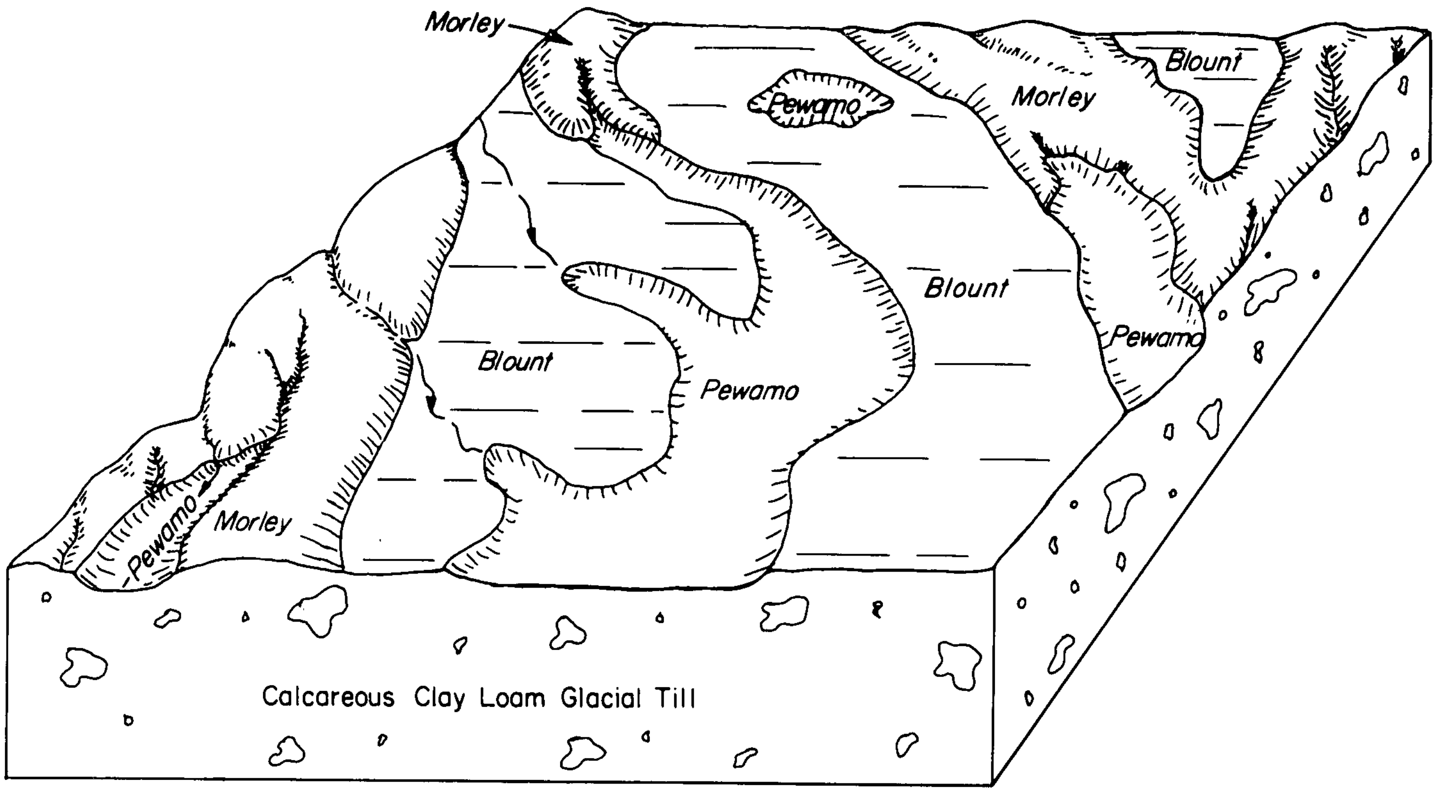

Figure 3.—**Parent material and position of soils in associations 3 and 4.**

4. Morley-Blount association

Deep, moderately well drained and somewhat poorly drained, nearly level to steep, medium-textured soils on uplands

This association is in upland areas, mostly in the northern two-thirds of the county but not on the Lake Maumee Plain. Morley soils make up about 50 percent of the acreage, and Blount soils about 40 percent. Small areas of Pewamo soils and of other soils make up the remaining 10 percent. (see figures 2, 3, and 4). This association occupies about 40 percent of the county.

Morley soils are gently sloping to steep and are moderately well drained. They have a surface layer of very dark grayish-brown and grayish-brown silt loam and a subsoil that is mostly dark yellowish-brown and brown clay and is mottled in the lower part.

Blount soils are nearly level and gently sloping and are somewhat poorly drained. They have a surface layer of very dark grayish-brown and dark grayish-brown loam or silt loam and a subsoil that is mostly dark-brown or dark grayish-brown, mottled silty clay and clay.

The more gently sloping soils in this association are suited to meadow crops and to corn, soybeans, and small grain, but the strongly sloping and steep soils are kept as permanent pasture or maintained in native vegetation. Erosion is a hazard, and wetness is a limitation.

5. Carlisle-Willette association

Deep, very poorly drained mucky soils in upland depressions

This association is in upland depressions and bogs in the northwestern and west-central parts of the county. Carlisle soils make up about 65 percent of the acreage, and Willette soils about 15 percent (fig. 4). Small areas of very poorly drained Lenawee, Montgomery, and Pewamo soils make up the remaining 20 percent. This association occupies about 2 percent of the county.

Carlisle soils have a surface layer of black muck, under which is very dark brown muck underlain by peat. Willette soils have a surface layer of black muck, under which is dark reddish-brown muck underlain by material that is mostly dark grayish-brown and light brownish-gray silty clay loam and clay loam.

If drained, the soils in this association are used for meadow crops; for corn, soybeans, and small grain; and for mint, vegetables, and other special crops. Wetness is the major limitation.

6. Hoytville-Nappanee association

Deep, somewhat poorly drained to very poorly drained, nearly level, medium-textured to fine-textured soils on uplands

This association is on uplands of the Lake Maumee Plain in the east-central part of the county. It is nearly level or slightly depressional. Hoytville soils make up about 70 percent of the acreage, and Nappanee soils about 20 percent (fig. 5). Small areas of Blount soils, which are somewhat poorly drained, and Pewamo soils, which are very poorly drained, make up the remaining 10 percent. This association occupies about 19 percent of the county.

Hoytville soils are very poorly drained. They have a surface layer of very dark gray silty clay and a subsoil of dark grayish-brown, mottled silty clay.

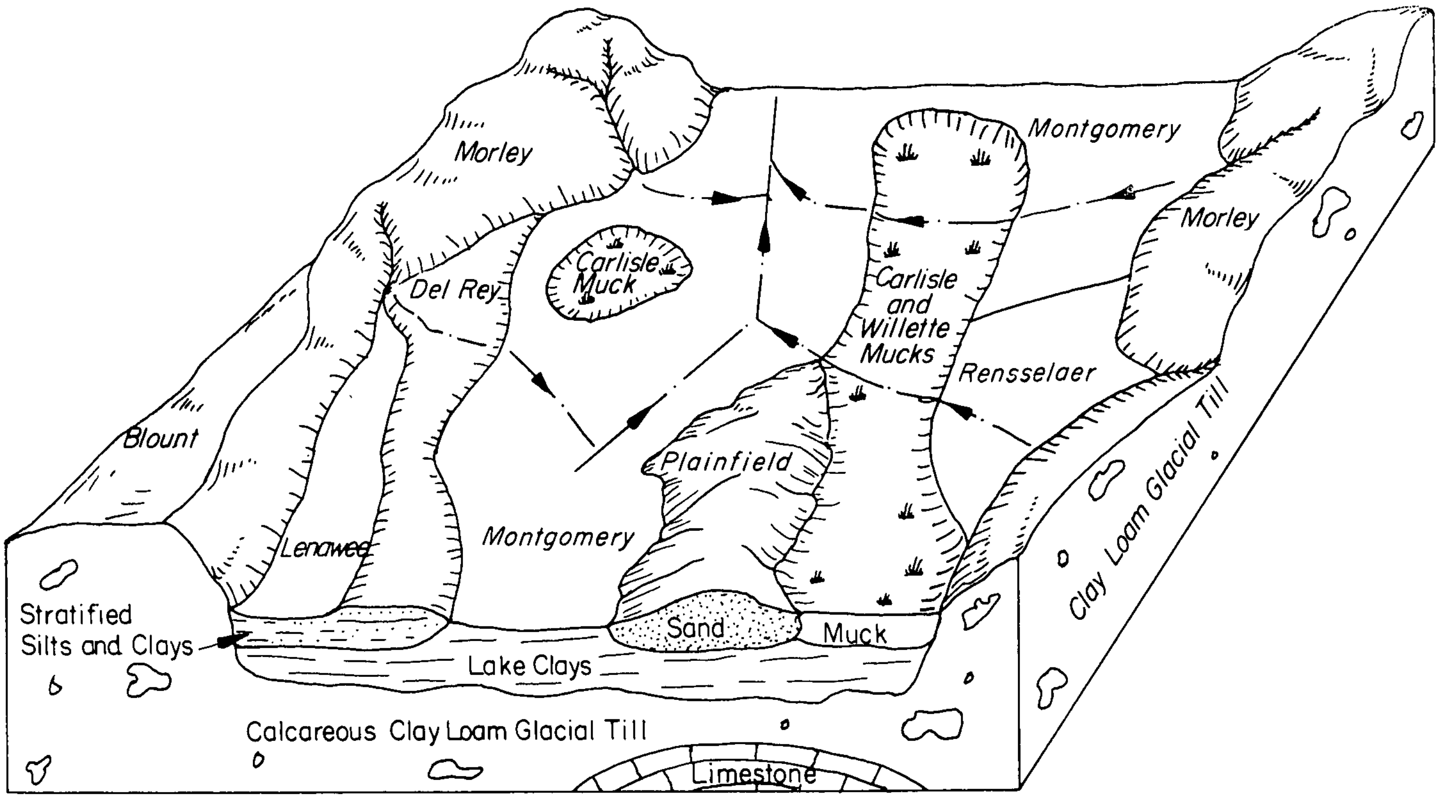

Figure 4.—**Parent material and position of soils in associations 4, 5, and 7 in the valley of the Little River.**

Nappanee soils are somewhat poorly drained. They have a surface layer of silt loam or silty clay loam that is very dark gray in the upper part and grayish brown in the lower part. The subsoil is mostly grayish-brown, mottled clay.

If drained, the soils of this association are used for meadow crops and for corn, soybeans, and small grain. Wetness is the major limitation.

7. *Lenawee-Montgomery-Rensselaer association*

Deep, very poorly drained, nearly level, medium-textured to fine-textured soils on uplands, in drainageways, and on stream terraces

This association consists of upland areas, drainageways, and stream terraces. Three areas are near New Haven, and one area is in the valley of the Little River, which was once a glacial sluiceway. Lenawee soils make up about 40 percent of the acreage, Montgomery soils about 40 percent, and Rensselaer soils about 20 percent (see fig. 4). This association occupies about 3 percent of the county.

Lenawee soils have a surface layer of very dark brown silty clay loam or mucky silty clay loam. The subsoil is dark grayish-brown and grayish-brown, mottled silty clay loam or clay loam.

Montgomery soils have a surface layer of black silty clay or silty clay loam. The subsoil is gray and dark-gray, mottled silty clay.

Rensselaer soils have a surface layer of very dark brown loam to silty clay loam that is mottled in the lower part. The subsoil is mostly gray and strong-brown, mottled sandy loam to sandy clay loam.

If drained, the soils in this association are used for meadow crops and for corn, soybeans, and small grain. Wetness is the major limitation.

8. *Rensselaer-Whitaker association*

Deep, somewhat poorly drained to very poorly drained, nearly level and gently sloping, moderately coarse textured to moderately fine textured soils on uplands and stream terraces

This association consists of two small areas on uplands and stream terraces. One area is southwest of New Haven, and the other is along the northern edge of the Lake Maumee Plain and northeast of New Haven. Rensselaer soils make up about 50 percent of the acreage, and Whitaker soils about 35 percent. The remaining 15 percent consists of small areas of Belmore soils, which are well drained, and of other soils (see fig. 5). This association occupies about 3 percent of the county.

Rensselaer soils are nearly level and are very poorly drained. They have a surface layer of very dark brown loam to silty clay loam or mucky silty clay loam that is mottled in the lower part. The subsoil is mostly gray or strong-brown, mottled sandy loam to sandy clay loam.

Whitaker soils are nearly level and gently sloping and are somewhat poorly drained. They have a surface layer of fine sandy loam, loam, or silt loam that is dark grayish brown in the upper part and pale brown in the lower part. The subsoil is yellowish-brown and gray, mottled clay loam or silty clay loam.

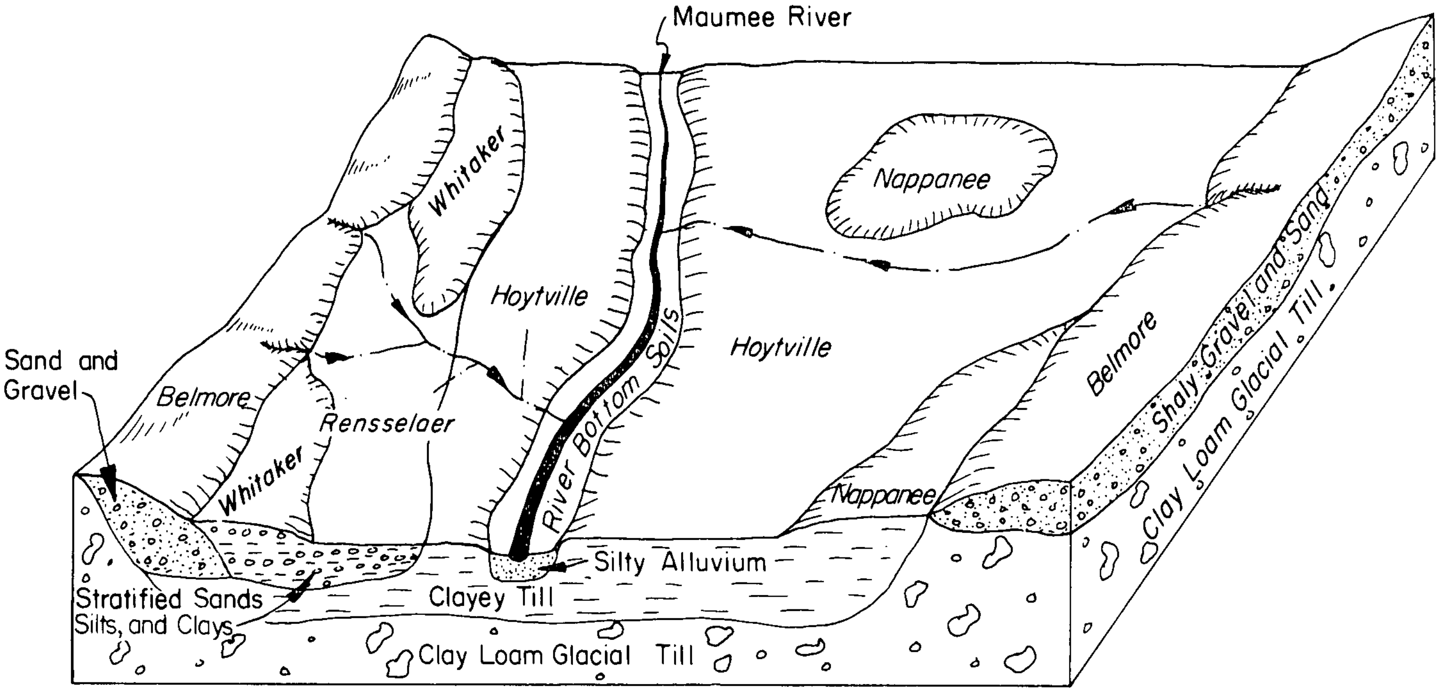

***Figure 5.*—Parent material and position of soils in associations 6 and 8 in the eastern part of the county.**

If drained, the soils in this association are used for meadow crops and for corn, soybeans, and small grain. Wetness is the major limitation.

Descriptions of the Soils

In this section the soils of Allen County are described in detail. The procedure is to describe first the soil series and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which the unit belongs.

The description of the soil series includes a description of a profile that is considered representative of all the soils of the series. If the profile of a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, unless they are apparent from the name of the mapping unit. The colors described are for moist soil, unless otherwise noted. Many of the terms used in describing soil series and mapping units are defined in the Glossary, and some are defined in the section "How This Survey Was Made."

The approximate acreage and proportionate extent of the soils are shown in table 1. At the back of this soil survey is the "Guide to Mapping Units," which lists the mapping units in the county and shows the capability unit, woodland group, and shrub suitability group each mapping unit is in.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Belmore fine sandy loam, 2 to 6 percent slopes	106	(1)
Belmore loam, 0 to 2 percent slopes	427	0. 1
Belmore loam, 2 to 6 percent slopes	871	. 2
Berrien loamy fine sand, moderately fine substratum, 0 to 2 percent slopes	187	(1)
Blount loam, 0 to 2 percent slopes	425	. 1
Blount silt loam, 0 to 2 percent slopes	113, 627	26. 4
Blount silt loam, 2 to 6 percent slopes	4, 041	. 9
Blount silt loam, 2 to 6 percent slopes, moderately eroded	11, 371	2. 6
Bono mucky silty clay	285	. 1
Bono silty clay	1, 367	. 3
Borrow pits	100	(1)
Brookston silt loam	222	(1)
Brookston silty clay loam	284	. 1
Carlisle muck	6, 165	1. 4
Chelsea fine sand, 2 to 6 percent slopes	431	. 1
Chelsea fine sand, 6 to 12 percent slopes	251	. 1
Chelsea fine sand, 12 to 18 percent slopes	97	(1)
Crosby loam, 0 to 2 percent slopes	601	. 1
Crosby silt loam, 0 to 2 percent slopes	2, 821	. 7
Crosby silt loam, 2 to 6 percent slopes	247	. 1
Crosby silt loam, 2 to 6 percent slopes, moderately eroded	201	(1)
Del Rey silt loam	2, 026	. 5
Eel loam	457	. 1
Eel silt loam	6, 605	1. 5
Fox loam, 0 to 2 percent slopes	433	. 1
Fox loam, 2 to 6 percent slopes	211	(1)
Fox loam, 6 to 12 percent slopes, moderately eroded	197	(1)
Genesee loam	792	. 2
Genesee silt loam	1, 092	. 3
Genesee silty clay loam	306	. 1

See footnote at end of table.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Area	Extent
	Acres	*Percent*
Genesee fine sandy loam, sandy variant	266	0. 1
Gilford fine sandy loam	203	(1)
Gravel pits	155	(1)
Haskins loam, 0 to 2 percent slopes	5, 126	1. 2
Haskins loam, 2 to 6 percent slopes	1, 152	. 3
Hoytville silty clay	58, 439	13. 6
Lenawee mucky silty clay loam	302	. 1
Lenawee silty clay loam	12, 914	3. 0
Linwood muck	135	(1)
Made land	162	(1)
Martinsville loam, 0 to 2 percent slopes	1, 110	. 3
Martinsville loam, 2 to 6 percent slopes	3, 451	. 8
Martinsville loam, 2 to 6 percent slopes, moderately eroded	1, 585	. 4
Martinsville loam, 6 to 12 percent slopes, moderately eroded	480	. 1
Martinsville loam, gravelly substratum, 0 to 2 percent slopes	1, 048	. 2
Martinsville loam, gravelly substratum, 2 to 6 percent slopes	604	. 1
Martinsville silt loam, 0 to 2 percent slopes	2, 034	. 5
Martinsville soils, 6 to 12 percent slopes, severely eroded	236	. 1
Mermill complex	786	. 2
Miami loam, 2 to 6 percent slopes, moderately eroded	797	. 2
Miami silt loam, 6 to 12 percent slopes, moderately eroded	260	. 1
Miami soils, 6 to 12 percent slopes, severely eroded	119	(1)
Montgomery silty clay	418	. 1
Montgomery silty clay loam	1, 125	. 3
Morley silt loam, 2 to 6 percent slopes	3, 872	. 9
Morley silt loam, 2 to 6 percent slopes, moderately eroded	39, 719	9. 2
Morley silt loam, 6 to 12 percent slopes	1, 321	. 3
Morley silt loam, 6 to 12 percent slopes, moderately eroded	8, 205	1. 9
Morley silt loam, 12 to 18 percent slopes, moderately eroded	584	. 1
Morley silt loam, 18 to 25 percent slopes, moderately eroded	735	. 2
Morley soils, 2 to 6 percent slopes, severely eroded	1, 773	. 4
Morley soils, 6 to 12 percent slopes, severely eroded	6, 467	1. 5
Morley soils, 12 to 18 percent slopes, severely eroded	740	. 2
Morley soils, 18 to 25 percent slopes, severely eroded	376	0. 1
Nappanee silt loam	7, 002	1. 6
Nappanee silty clay loam	8, 006	1. 9
Oshtemo fine sandy loam, loamy substratum, 0 to 2 percent slopes	729	. 2
Oshtemo fine sandy loam, loamy substratum, 2 to 6 percent slopes	800	. 2
Oshtemo fine sandy loam, loamy substratum, 6 to 12 percent slopes, moderately eroded	272	. 1
Oshtemo sandy loam, 0 to 2 percent slopes	627	. 1
Oshtemo sandy loam, 2 to 6 percent slopes	735	. 2
Pewamo mucky silty clay loam	582	. 1
Pewamo silty clay loam	66, 568	15. 5
Plainfield fine sand, moderately fine substratum, 2 to 6 percent slopes	376	. 1
Plainfield fine sand, moderately fine substratum, 6 to 12 percent slopes	136	(1)
Rawson fine sandy loam, 2 to 6 percent slopes	241	. 1
Rawson loam, 0 to 2 percent slopes	179	(1)
Rawson loam, 2 to 6 percent slopes, moderately eroded	2, 110	. 5
Rawson loam, 6 to 12 percent slopes, moderately eroded	377	. 1
Rensselaer loam	1, 822	. 4
Rensselaer mucky silty clay loam	208	(1)
Rensselaer silt loam	725	. 2
Rensselaer silty clay loam	8, 640	2. 0
St. Clair silt loam, 2 to 6 percent slopes	221	. 1
St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded	352	. 1
St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded	243	. 1
Shoals silty clay loam	3, 300	. 8
Tawas muck	403	. 1
Wallkill silt loam	307	. 1
Wallkill silty clay loam	300	. 1
Washtenaw silt loam	1, 937	. 5
Westland loam	236	. 1
Westland silty clay loam	170	(1)
Whitaker fine sandy loam, 0 to 2 percent slopes	666	. 2
Whitaker loam, 0 to 2 percent slopes	2, 060	. 5
Whitaker loam, 2 to 6 percent slopes	315	. 1
Whitaker silt loam, 0 to 2 percent slopes	3, 988	. 9
Willette muck	1, 222	. 3
Water (more than 40 acres)	640	. 1
Total	429, 440	100. 0

[1] Less than 0.05 percent.

Belmore Series

The Belmore series consists of deep, well-drained, nearly level and gently sloping soils. These soils are on beach ridges east of New Haven.

Belmore soils have a 9-inch surface layer of dark grayish-brown, friable loam. The subsoil is brown and is friable to slightly firm heavy loam in the uppermost 6 inches, firm gravelly sandy clay loam in the middle 29 inches, and friable fine sandy loam in the lowermost 4 inches. The underlying material is calcareous sand and gravel in which there are strata of silt and clay.

Although droughty, these soils are suited to the commonly grown crops. Crops respond well to fertilizer.

Profile of a Belmore loam in a cultivated field in the NW¼NW¼SE¼ sec. 14, T. 30 N., R. 14 E.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium, granular structure; friable when moist; medium acid; abrupt, smooth boundary.

B1—9 to 15 inches, dark yellowish-brown (10YR 4/4) heavy loam; weak, medium to coarse, subangular blocky structure; friable or slightly firm when moist; medium acid; clear, smooth boundary.

B21t—15 to 35 inches, dark-brown to brown (7.5YR 4/4) gravelly sandy clay loam; moderate, medium, subangular blocky structure; few clay films on ped faces; firm when moist; medium acid; clear, wavy boundary.

B22t—35 to 44 inches, strong-brown (7.5YR 5/6) gravelly sandy clay loam; moderate, medium to coarse, subangular blocky structure; firm when moist; medium acid; very dark grayish-brown (10YR 3/2) organic films on many ped faces; clear, wavy boundary.

B3—44 to 48 inches, brown (10YR 5/3) light fine sandy loam; weak, medium, subangular blocky structure; friable when moist; slightly acid to neutral; abrupt, wavy boundary.

C—48 to 60 inches, dark-brown to brown (10YR 4/3–5/3) sandy and gravelly material, weakly stratified with silt and clay and containing some shale; very friable when moist; calcareous.

The Ap horizon ranges from loam to fine sandy loam in texture and from dark brown to very dark grayish brown in color. The depth to the C horizon ranges from 25 to more than 60 inches. The degree of stratification and the texture in the C horizon vary widely.

Belmore fine sandy loam, 2 to 6 percent slopes (BeB).—Included with this soil in mapping were small areas where the slope is less than 2 percent or more than 6 percent and some small areas of a moderately eroded soil.

The erosion hazard and droughtiness are the main limitations. (Capability unit IIIe–13; woodland group 1)

Belmore loam, 0 to 2 percent slopes (BhA).—Included with this soil in mapping were small areas of silt loam.

Even though droughtiness is a major limitation, this Belmore soil is well suited to corn, soybeans, wheat, and hay crops in years when rainfall is normal or above normal. These crops respond well to fertilizer. (Capability unit IIs–1; woodland group 1)

Belmore loam, 2 to 6 percent slopes (BhB).—Included with this soil in mapping were a few spots of silt loam and small areas of a very dark brown soil that is neutral in reaction throughout the profile.

Even though it is erodible and droughty, this Belmore soil is well suited to early truck crops, corn, wheat, and soybeans. These crops respond well to fertilizer. (Capability unit IIe–9; woodland group 1)

Berrien Series [1]

The Berrien series consists of deep, moderately well drained, nearly level soils. These soils are east of New Haven and in the valley of the Little River. The native vegetation was hardwood trees.

Berrien soils have an 18-inch surface layer of very friable, strongly acid loamy fine sand that is dark grayish brown in the uppermost 8 inches and brown below a depth of 8 inches. The 44-inch underlying layer is loose, pale-brown, strongly acid loamy fine sand mottled with yellowish brown. Beneath this is light-gray, firm, calcareous silty clay loam mottled with yellowish brown.

These soils are too droughty for most crops grown in this county, but they are suited to vegetables and to some special crops. These crops respond well to lime and fertilizer.

Profile of a Berrien loamy fine sand in a cultivated field in the SW¼NW¼ sec. 11, T. 30 N., R. 13 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loamy fine sand; weak, fine, granular structure; very friable when moist; strongly acid; abrupt, smooth boundary.

A2—8 to 18 inches, brown (10YR 5/3) loamy fine sand; single grain; very friable when moist; strongly acid; clear, smooth boundary.

C1—18 to 62 inches, pale-brown (10YR 6/3) loamy fine sand; common, medium, distinct mottles of yellowish brown (10YR 5/4) in the uppermost 4 inches; progressively larger and more numerous mottles, including some of light brownish gray (10YR 6/2), as depth increases; single grain; loose when moist; strongly acid in upper part grading to medium acid in lower part; abrupt, wavy boundary.

IIC2—62 to 72 inches, light-gray (10YR 6/1) silty clay loam; common, coarse, distinct mottles of yellowish brown (10YR 5/8); massive; firm when moist; calcareous.

Mottling occurs at depths between 16 and 36 inches. The IIC2 horizon is at a depth of 42 to 70 inches and ranges from heavy loam to clay in texture.

Berrien loamy fine sand, moderately fine substratum, 0 to 2 percent slopes (BkA).—Included with this soil in mapping were small areas that have slopes of more than 2 percent and small areas of a soil that has a texture of sandy loam throughout the profile.

Droughtiness is the major limitation. Irrigated areas are well suited to vegetables, berries and other small fruits, melons, and other special crops. These crops respond well to lime and fertilizer. Other crops commonly grown in the county are not suitable. (Capability unit IVs–1; woodland group 6)

Blount Series

The Blount series consists of deep, somewhat poorly drained, nearly level and gently sloping soils. These soils occur on upland till plains throughout the county. The native vegetation was hardwood forest.

Blount soils have a 9-inch surface layer of very dark grayish-brown or dark grayish-brown, friable silt loam. The uppermost 4 inches of the subsoil consists of grayish-brown, friable silty clay loam mottled with dark yellowish brown; the middle 5 inches, of dark-brown and yellowish-brown, firm silty clay mottled with grayish brown; and the lowermost 9 inches, of dark grayish-brown or brown, very firm clay mottled with dark yellowish brown. The underlying material is dark grayish-brown, firm, calcareous silty clay loam mottled with dark yellowish brown.

Wetness is the major limitation. Drained areas are well suited to the commonly grown crops. Crops respond well to lime and fertilizer.

Profile of a Blount silt loam in a cultivated field 235 feet south and 205 feet east of the northwest corner of the NE¼ sec. 20, T. 29 N., R. 14 E.

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) or dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable when moist; slightly acid; clear, smooth boundary.

B1t—9 to 13 inches, grayish-brown (10YR 5/2) silty clay loam; few, medium, faint mottles of dark yellowish brown (10YR 4/4); moderate, fine, subangular blocky structure; friable or firm when moist; thin clay films on few ped faces; very strongly acid; clear, smooth boundary.

B21t—13 to 18 inches, dark-brown (10YR 4/3) to yellowish-brown (10YR 5/4) silty clay; many, medium, faint mottles of grayish brown (10YR 5/2); weak, medium, prismatic structure breaking to moderate, medium, angular blocky structure; firm or very firm when moist; thin clay films on ped faces; very strongly acid; clear, wavy boundary.

B22t—18 to 27 inches, dark grayish-brown (10YR 4/2) to brown (10YR 5/3) clay; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); weak, coarse, prismatic structure breaking to moderate, coarse, angular blocky structure; very firm when moist; thin clay films on ped faces; strongly acid; clear, wavy boundary.

C—27 to 40 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; many, medium, distinct mottles of dark yellowish brown (10YR 4/4); moderate, coarse, angular blocky structure; firm or very firm when moist; calcareous.

[1] After completion of this soil survey, the Berrien soil series was made inactive. Soils named as the Berrien series in this county will be named as the Brems series in later surveys.

The texture of the A horizon is silt loam or loam. The depth to the calcareous underlying material ranges from 20 to 40 inches.

Physical and chemical data for three profiles of the Blount soils have been published in Soil Survey Investigations Report No. 18 (*8*).

Blount loam, 0 to 2 percent slopes (BlA).—Included with this soil in mapping were small areas of moderately eroded Blount silt loam and small depressions where the soil is Pewamo silty clay loam.

If drained, this Blount soil is well suited to hay and to corn, soybeans, oats, wheat, and other crops. These crops respond well to lime and fertilizer. (Capability unit IIw–2; woodland group 2)

Blount silt loam, 0 to 2 percent slopes (BmA).—Included with this soil in mapping were small areas of very dark brown soils.

If drained, this Blount soil is well suited to hay, corn, soybeans, oats, and wheat. These crops respond well to lime and fertilizer. (Capability unit IIw–2; woodland group 2)

Blount silt loam, 2 to 6 percent slopes (BmB).—Included with this soil in mapping were small areas of Pewamo silty clay loam and Blount silt loam, 2 to 6 percent slopes, moderately eroded.

Even though there is a hazard of erosion and a problem in controlling runoff in addition to the main limitation of wetness, this Blount soil is well suited to hay, corn, soybeans, oats, and wheat. These crops respond well to lime and fertilizer. (Capability unit IIw–2; woodland group 2)

Blount silt loam, 2 to 6 percent slopes, moderately eroded (BmB2).—Erosion has removed 3 to 6 inches of soil material from the original surface layer of this soil.

Even though there is a problem of controlling runoff and erosion, in addition to the main limitation of wetness, this Blount soil is suited to the crops commonly grown. Crops respond well to lime and fertilizer. (Capability unit IIw–2; woodland group 2)

Bono Series

The Bono series consists of deep, very poorly drained, nearly level soils. Most of these soils are in nearly level areas or shallow depressions on the Lake Maumee Plain or in the valley of the Little River, but a few small areas are near beds of muck in the northern part of the county. The native vegetation consisted mainly of hardwood forest and water-tolerant grasses.

Bono soils have a 19-inch surface layer that is firm silty clay in the uppermost 8 inches and very firm clay in the lower part. The subsoil is 38 inches thick and consists of extremely firm or firm clay mottled with yellowish brown, reddish brown, or dark brown. This layer is dark gray in the uppermost 17 inches and olive gray in the lower part. The underlying material is pale-olive, calcareous clay mottled with light yellowish brown.

Wetness is the major limitation, and good tilth is difficult to maintain because of the large amount of clay in the surface layer. Adequately drained areas are well suited to corn and soybeans. These crops respond well to fertilizer.

Profile of Bono silty clay in a cultivated field in the NW¼SW¼NW¼ sec. 16, T. 30 N., R. 12 E.

Ap—0 to 8 inches, black (5Y 2/1) silty clay; moderate, medium, subangular blocky structure; firm when moist; slightly acid; abrupt, smooth boundary.

A1—8 to 19 inches, black (5Y 2/1) clay; moderate, coarse, prismatic structure breaking to moderate, medium and coarse, angular blocky structure; very firm when moist; few, fine, faint, dark-brown (7.5YR 4/4) clay films and organic stains on ped faces; medium acid; clear, smooth boundary.

B21g—19 to 26 inches, dark-gray (2.5Y 4/1) clay; common, fine, distinct mottles of dark yellowish brown (10YR 4/4) and dark brown (7.5YR 4/4); moderate, very coarse, prismatic structure breaking to strong, medium and coarse, angular blocky structure; extremely firm when moist; slightly acid; clear, wavy boundary.

B22g—26 to 36 inches, dark-gray (2.5Y 4/1) or gray (2.5Y 5/1) clay; common, medium, distinct mottles of dark reddish brown (5YR 3/2); moderate, very coarse, prismatic structure breaking to strong, coarse, angular blocky structure; very firm when moist; slightly acid; clear, wavy boundary.

B23g—36 to 57 inches, olive-gray (5Y 5/2) to light olive-gray (5Y 6/2) clay; common, fine, distinct mottles of pale olive (5Y 6/4) and dark brown (7.5YR 4/4); weak, coarse, prismatic structure breaking to weak, coarse, angular blocky structure; neutral; very firm when moist; diffuse, wavy boundary.

C—57 to 72 inches, pale-olive (5Y 6/3) clay; few, fine, distinct mottles of light yellowish brown (10YR 6/4); massive; calcareous.

In some places, particularly in the valley of the Little River, there is a 3- to 12-inch layer of organic material above the A horizon. The A horizon ranges from 15 to 23 inches in thickness. In some places there are thin lenses of sand and gravel in the lower part of the B horizon and in the C horizon. The depth to the calcareous underlying material ranges from 25 to 70 inches.

Bono mucky silty clay (0 to 2 percent slopes) (Bn).—This soil is in deep depressions, most of which are surrounded by Bono silty clay. It occurs mainly in the valley of the Little River. The uppermost 3 to 12 inches of the surface layer is organic material.

If drained, this soil is well suited to corn and soybeans. These crops respond well to fertilizer. Drainage is difficult because the soil is in deep depressions. (Capability unit IIIw–2; woodland group 4)

Bono silty clay (0 to 2 percent slopes) (Bo).—Included with this soil in mapping were a few small areas of silty clay loam and a few small areas of a soil that has a texture of silty clay loam or light clay loam throughout the profile.

If drained this Bono soil is well suited to corn and soybeans. These crops respond well to fertilizer. (Capability unit IIIw–2; woodland group 4)

Borrow Pits

Borrow pits (Bp) are small areas from which soil material has been removed for use as road fill and in manufacturing draintile.

Some Borrow pits could be developed for wildlife habitat and recreational use. (Capability unit VIIe–3; not placed in a woodland group)

Brookston Series

The Brookston series consists of deep, very poorly drained, nearly level soils in shallow depressions in the northwestern part of the county. The native vegetation consisted of hardwood forest and water-tolerant grasses.

Brookston soils have a 13-inch surface layer of very dark gray, friable light silty clay loam. The 41-inch subsoil is firm clay loam that is very dark grayish brown mottled with dark brown in the uppermost part and mainly gray

mottled with gray and brown in the lower part. The underlying material is gray or olive-gray, calcareous loam mottled with dark grayish brown.

Wetness is the major limitation. Drained areas are well suited to the commonly grown crops. Crops respond well to fertilizer.

Profile of Brookston silty clay loam in a cultivated field in the NE¼NW¼SE¼ sec. 7, T. 32 N., R. 12 E.

Ap—0 to 9 inches, very dark gray (10YR 3/1) to black (10YR 2/1) light silty clay loam; moderate, medium and coarse, granular structure; friable when moist; medium acid; clear, smooth boundary.

A1—9 to 13 inches, very dark gray (10YR 3/1) light silty clay loam; moderate, coarse, granular structure; friable; medium acid; clear, wavy boundary.

B1g—13 to 22 inches, very dark grayish-brown (2.5Y 3/2) to dark grayish-brown (10YR 4/2) clay loam; few faint mottles of dark brown (7.5YR 4/4); weak to moderate, fine and medium, subangular blocky structure; firm when moist; neutral; gradual, wavy boundary.

B21tg—22 to 31 inches, dark-gray (5Y 4/1) clay loam; common, fine, distinct mottles of dark brown (10YR 4/3); moderate, medium and coarse, subangular blocky structure; firm when moist; thin clay films on ped faces; dark grayish-brown (10YR 4/2) organic stainings in root channels, wormholes, and cracks; neutral; gradual, wavy boundary.

B22tg—31 to 42 inches, gray (5Y 6/1) clay loam; many, medium, distinct mottles of strong brown (7.5YR 5/6); moderate, coarse, subangular blocky structure; firm when moist; thin clay films on ped faces; dark grayish-brown (10YR 4/2) organic stainings in root channels; neutral; gradual, wavy boundary.

B23tg—42 to 48 inches, mottled yellowish-brown (10YR 5/6) and gray (5Y 6/1) clay loam; weak, coarse, subangular blocky structure; firm when moist; thin clay films on ped faces; neutral; gradual, wavy boundary.

B3g—48 to 54 inches, olive-brown (2.5Y 4/4) light clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6) and gray (5Y 5/1); weak, coarse, subangular blocky structure; friable when moist; neutral; gradual, wavy boundary.

C—54 to 65 inches, gray (5YR 5/1) to olive-gray (5Y 5/2) loam (glacial till); mottles of dark grayish brown (10YR 4/2); massive; calcareous.

The A horizon ranges from very dark gray to black in color and from silt loam to silty clay loam in texture. The calcareous underlying material is 30 to 54 inches from the surface and ranges from loam to light clay loam in texture.

Brookston silt loam (0 to 2 percent slopes) (Br).—Included with this soil in mapping were a few small areas of loam.

If drained, this Brookston soil is well suited to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. (Capability unit IIw–1; woodland group 4)

Brookston silty clay loam (0 to 2 percent slopes) (Bs). If drained, this soil is well suited to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. (Capability unit IIw–1; woodland group 4)

Carlisle Series

The Carlisle series consists of deep, very poorly drained muck soils. These soils occur in flat and depressional bogs on uplands and in the valley of the Little River. The native vegetation consisted mainly of hardwood trees, marsh grass, and sedges.

Carlisle soils have a 12-inch surface layer of black, loose muck that contains a few small pieces of partly decayed wood. The 24-inch subsoil is very dark brown, loose muck that contains many fragments of partly decomposed wood. The underlying material is dark reddish-brown, very friable peat.

Wetness is the major limitation. Drained areas are well suited to the commonly grown crops and to mint, onions, potatoes, and other special crops. These crops respond well to fertilizer.

Profile of Carlisle muck in the SW¼NE¼ sec. 7, T. 31 N., R. 11 E.

1—0 to 12 inches, black (10YR 2/1) muck; weak, fine, granular structure; granules are loose when moist and slightly hard when dry; medium acid; scattered small fragments of partly decayed wood; clear, smooth boundary.

2—12 to 24 inches, very dark brown (10YR 2/2) muck; coarse granular to fibrous, mucky material; fragments of partly decomposed wood are larger and more numerous than in horizon 1; loose when moist and soft when dry; slightly acid; diffuse, smooth boundary.

3—24 to 36 inches, very dark brown (10YR 2/2) muck; woody material is less well decomposed than that in horizon 2, and many fragments are undecomposed; loose when moist and soft when dry; slightly acid.

4—36 to 48 inches, dark reddish-brown (5YR 3/3) peat; 30 percent of the peat is moderately decomposed and fibrous, and 10 percent or less is woody; massive; nonplastic and nonsticky when wet, very friable when moist, and hard when dry; slightly acid to neutral.

The depth to the underlying peat ranges from 24 to more than 40 inches. Below the peat is sand, silt, clay, or glacial till.

Carlisle muck (0 to 2 percent slopes) (Ca).—Included with this soil in mapping were small areas of peat and small areas of a soil that has a very strongly acid surface layer.

If drained, this Carlisle soil is well suited to hay, corn, and soybeans, and also to mint, potatoes, onions, and other vegetables. Because of the high content of available nitrogen, small grain often lodges. The suitable crops respond well to fertilizer, particularly to phosphate and potash. (Capability unit IIIw–8; woodland group 9)

Chelsea Series

The Chelsea series consists of deep, excessively drained, gently sloping to strongly sloping soils. These soils occur east of New Haven and in the valley of the Little River. The native vegetation was mostly oak and hickory.

Chelsea soils have a 30-inch surface layer of fine sand that is dark grayish brown or grayish brown and is very friable in the upper part and brown and loose in the lower part. The 25-inch subsoil is dark-brown or brown, loose loamy fine sand stratified with bands of very friable sandy loam ¼ inch to 3 inches thick. The underlying material is brown, loose fine sand.

Droughtiness is the major limitation. Wind erosion is a hazard and needs to be controlled. Alfalfa is a well-suited crop. Corn and soybeans can be grown, but the risk is high. Crops respond to lime and fertilizer.

Profile of a Chelsea fine sand in the NW¼SW¼ sec. 5, T. 30 N., R. 14 E.

A11—0 to 4 inches, dark grayish-brown (10YR 4/2) fine sand; weak, fine and medium, granular structure; very friable when moist; medium acid; clear, wavy boundary.

A12—4 to 10 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) fine sand; weak, fine, granular structure; very friable when moist; medium acid; clear, wavy boundary.

A2—10 to 30 inches, brown (10YR 5/3) fine sand; single grain; loose when moist; medium acid to neutral; abrupt, wavy and broken boundary.

A2&Bt—30 to 55 inches, dark-brown to brown (7.5YR 4/4) to reddish-brown (5YR 4/4) sandy loam and loamy fine sand; the Bt horizons are thin bands (¼ inch to 3 inches thick), commonly wavy and discontinuous, separated by A2 horizons; A2 is single grain and is loose when moist; Bt has weak, very fine to medium, subangular blocky structure and is very friable when moist; medium acid; clear, wavy boundary.

C—55 to 72 inches, brown (7.5YR 5/4) fine sand; single grain; loose when moist; slightly acid.

The depth to banded material ranges from 30 to 55 inches. Reaction in the surface layer and subsoil ranges from strongly acid to slightly acid.

Chelsea fine sand, 2 to 6 percent slopes (ChB).—This soil occurs on small narrow ridges and on knolls. Included in mapping were small areas that have slopes of less than 2 percent.

Droughtiness is the major limitation. Wind erosion is a hazard and needs to be controlled. Alfalfa is well suited. Corn and soybeans can be grown in unirrigated areas, but the risk is high. Irrigated areas are well suited to row crops and truck crops. Crops respond to lime and fertilizer. (Capability unit IIIs–1; woodland group 7)

Chelsea fine sand, 6 to 12 percent slopes (ChC).—This soil occurs in small areas on narrow ridges. Included in mapping were eroded spots on the windward side of the ridges.

Wind erosion is a hazard, and droughtiness is a serious limitation. Alfalfa is a suitable crop. Corn and soybeans can be grown in unirrigated areas, but the risk is high. Irrigated areas are suited to the crops commonly grown in the county. Crops respond to lime and fertilizer. (Capability unit IIIe–12; woodland group 7)

Chelsea fine sand, 12 to 18 percent slopes (ChD).—This soil is along ridges. Included in mapping were severely eroded spots and some slopes of more than 18 percent.

Because of the erosion hazard and droughtiness, this Chelsea soil should be kept in permanent pasture. Pasture responds to lime and fertilizer. (Capability unit IVe–12; woodland group 7)

Crosby Series

The Crosby series consists of deep, somewhat poorly drained, nearly level and gently sloping soils. These soils are mostly near Huntertown, in other areas in the northwestern part of the county, and north of New Haven. The native vegetation was mainly hardwood forest.

Crosby soils have a 9-inch surface layer of dark grayish-brown, friable silt loam and a 22-inch subsoil of yellowish-brown and grayish-brown, firm clay loam mottled with yellowish brown and brownish gray. The underlying material is brown, friable, calcareous loam containing a few fragments of shale and crystalline rocks.

Wetness is the major limitation, and erosion is a hazard. Adequately drained areas are well suited to crops. Crops respond well to lime and fertilizer.

Profile of a Crosby silt loam in a cultivated field, 200 feet north of a county road along the railroad track beneath the powerline in the SE¼SW¼SE¼ sec. 18, T. 32 N., R. 12 E.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable when moist; slightly acid; abrupt, smooth boundary.

B1—9 to 15 inches, yellowish-brown (10YR 5/4) light clay loam; many, fine, faint mottles of grayish brown (10YR 5/2) and yellowish brown (10YR 5/8); moderate, medium, subangular blocky structure; few, thin, faint organic films in root channels; slightly firm when moist; slightly acid; clear, wavy boundary.

B21t—15 to 23 inches, grayish-brown (10YR 5/2) clay loam; many fine and medium mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6); moderate, medium and coarse, subangular blocky structure; firm when moist; thin clay films on few ped faces; strongly acid; clear, wavy boundary.

B22t—23 to 31 inches, light yellowish-brown (10YR 6/4) clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2); moderate, medium and coarse, subangular blocky structure; firm when moist; thin clay films on numerous ped faces; slightly acid; clear, wavy boundary.

C—31 to 42 inches, brown (10YR 5/3) to light yellowish-brown (10YR 6/4) loam; weak, coarse, subangular blocky structure; friable when moist; few fragments of shale; calcareous.

The A horizon is loam or silt loam, and the B horizon is clay loam or heavy silty clay loam. The depth to the calcareous underlying material ranges from 20 to 42 inches.

Crosby loam, 0 to 2 percent slopes (CrA).—This soil occurs near Huntertown and north of New Haven. Included in mapping were moderately eroded spots.

Wetness is the major limitation. Drained areas are well suited to corn, soybeans, small grain, and hay. These crops respond well to lime and fertilizer. (Capability unit IIw-2; woodland group 2)

Crosby silt loam, 0 to 2 percent slopes (CsA).—Included with this soil in mapping were a few moderately eroded spots.

Wetness is the major limitation. Drained areas are well suited to corn, soybeans, small grain, and hay. These crops respond well to lime and fertilizer. (Capability unit IIw-2; woodland group 2)

Crosby silt loam, 2 to 6 percent slopes (CsB).—Wetness is the major limitation in the use of this soil. Drained areas are well suited to corn, soybeans, small grain, and hay. These crops respond well to lime and fertilizer. (Capability unit IIw-2; woodland group 2)

Crosby silt loam, 2 to 6 percent slopes, moderately eroded (CsB2).—What remains of the original surface layer of this soil has been mixed with part of the lighter colored subsoil in most places. Included in mapping were a few severely eroded spots.

Wetness is the major limitation, and erosion is a hazard. Drained areas are well suited to corn, soybeans, small grain, and hay. These crops respond well to lime and fertilizer. (Capability unit IIw-2; woodland group 2)

Del Rey Series

The Del Rey series consists of deep, somewhat poorly drained, nearly level soils. These soils are on lake terraces in the valley of the Little River and along the St. Mary's River and the Maumee River. The native vegetation was hardwood forest.

Del Rey soils have an 8-inch surface layer of dark grayish-brown friable silt loam. The uppermost 4 inches of the subsoil is mottled, dark grayish-brown, firm silty clay loam, and the lower part is mottled, grayish-brown or brown, very firm silty clay loam. The underlying material is grayish-brown, very firm, calcareous silty clay loam mottled with brown and yellow.

Wetness is the major limitation. Drained areas are well suited to crops. Crops respond well to lime and fertilizer.

Profile of Del Rey silt loam in a cultivated field in the NE¼NE¼ sec. 2, T. 30 N., R. 13 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; friable when moist; slightly acid; abrupt, smooth boundary.

B21t—8 to 12 inches, dark grayish-brown (10YR 4/2) silty clay loam; few, fine, faint mottles of strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; firm when moist; few clay films on ped surfaces; medium acid; clear, wavy boundary.

B22t—12 to 19 inches, grayish-brown (10YR 5/2) heavy silty clay loam; common, fine, distinct mottles of strong brown (7.5YR 5/6 to 5/8) and pale brown (10YR 6/3); moderate, medium and coarse, angular blocky structure; very firm when moist; few clay films on ped faces; gradual, wavy boundary.

B23t—19 to 26 inches, brown (10YR 5/3) heavy silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/6 to 5/8) and light brownish gray (10YR 6/2); moderate, medium and coarse, angular blocky structure; very firm when moist; few clay films on ped faces; slightly acid; abrupt, wavy boundary.

C—26 to 42 inches, grayish-brown (10YR 5/2) to light brownish-gray (10YR 6/2) silty clay loam; many, coarse, distinct mottles of yellowish brown (10YR 5/6) and brownish yellow (10YR 6/6); moderate, coarse, subangular blocky structure; very firm when moist; calcareous.

In some places there are thin lenses of silt and sand in the B and C horizons. The depth to the calcareous underlying material ranges from 25 to 42 inches.

Del Rey silt loam (0 to 2 percent slopes) (Dr).—Included with this soil in mapping were small areas of loam or silty clay loam and some small areas of a gently sloping, slightly eroded or moderately eroded soil.

If drained, this Del Rey soil is well suited to the common crops, which include hay, corn, soybeans, oats, and wheat. These crops respond well to lime and fertilizer. (Capability unit IIw–2; woodland group 2)

Eel Series

The Eel series consists of deep, moderately well drained, nearly level soils on bottom lands. The native vegetation was mostly water-tolerant hardwood trees.

Eel soils have a 20-inch surface layer of dark grayish-brown, friable silt loam. The underlying material is firm silty clay loam that is brown in the uppermost 4 inches and dark yellowish brown mottled with dark gray in the lower part.

Even though flooding and streambank erosion are serious hazards, these soils are well suited to the crops commonly grown in the county. Crops respond well to fertilization and to other good management practices.

Profile of Eel silt loam in a cultivated field in the NW¼NW¼ sec. 23, T. 31 N., R. 14 E.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine and medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

A1—7 to 20 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium and coarse, granular structure; friable when moist; neutral; clear, wavy boundary.

C1—20 to 24 inches, brown (10YR 5/3) light silty clay loam; weak, fine and medium, granular structure; firm when moist; neutral; gradual, wavy boundary.

C2g—24 to 40 inches, dark yellowish-brown (10YR 4/4) light silty clay loam; common, medium, distinct mottles of dark gray (10YR 4/1); weak, fine, granular structure and weak, fine, subangular blocky structure; firm when moist; neutral.

The Ap horizon ranges from dark grayish brown to dark brown in color and from loam to silt loam in texture. In places the C horizon contains strata of silt loam, loam, and silty clay loam, and lenses of sand and gravel. In places there is calcareous material at a depth of more than 38 inches.

Eel loam (0 to 2 percent slopes) (Ee).—This soil is on streambanks close to the main channels. Included in mapping were small areas of sandy loam.

Flooding and streambank erosion are the main hazards. Corn, soybeans, small grain, and hay are well suited. These crops respond well to fertilization and other good management practices. The size and shape of some of the areas prevent intensive use. (Capability unit I–2; woodland group 3)

Eel silt loam (0 to 2 percent slopes) (Es).—Included with this soil in mapping were small areas of Eel loam.

Flooding and streambank erosion are the main hazards. Corn, soybeans, small grain, and hay are well suited. These crops respond well to fertilization and other good management practices. The size and shape of some of the areas prevent intensive use. (Capability unit I–2; woodland group 3)

Fox Series

The Fox series consists of deep, well-drained, nearly level to moderately sloping soils. These soils are on terraces along the major streams and on outwash plains near Huntertown. The native vegetation was hardwood forest.

Fox soils have a 12-inch surface layer of friable loam that is dark grayish brown in the uppermost 8 inches and brown and yellowish brown in the lower part. The 24-inch subsoil is firm gravelly clay loam that is yellowish brown in the uppermost 7 inches and reddish brown in the lower part. The underlying material is light-gray, loose, calcareous sand and gravel.

These soils are droughty. They are well suited to deep-rooted legumes and fall-seeded small grain but not to corn, soybeans, and spring-seeded small grain. Crops respond to lime and fertilizer.

Profile of a Fox loam in a cultivated field in the NW¼NE¼ sec. 9, T. 31 N., R. 13 E.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loam; weak, medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

A2—8 to 12 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) loam; very weak, thin, platy structure; friable when moist; neutral; clear, smooth boundary.

B1—12 to 15 inches, yellowish-brown (10YR 5/6) loam to gravelly clay loam; weak, fine, subangular blocky structure; friable or firm when moist; slightly acid; clear, wavy boundary.

B21t—15 to 19 inches, brown (7.5YR 5/4) to strong-brown (7.5YR 5/6) light gravelly clay loam; moderate, coarse, subangular blocky structure; firm when moist; thin clay films on many ped faces; medium acid; gradual, wavy boundary.

B22t—19 to 28 inches, reddish-brown (5YR 4/4) to yellowish-red (5YR 4/6) gravelly clay loam; moderate, coarse, subangular blocky structure; firm when moist; thin clay films on many ped faces; medium acid; gradual, wavy boundary.

B23t—28 to 36 inches, reddish-brown (5YR 4/3 or 4/4) gravelly clay loam; weak, coarse, subangular blocky and angular blocky structure; firm when moist; medium clay

films on most ped faces; slightly acid; abrupt, irregular boundary; tongues or lenses extend into the underlying material.

IIC—36 to 44 inches, light-gray (2.5Y 7/2) sand and gravel; single grain; loose when moist; calcareous.

The Ap horizon is very dark grayish brown and dark grayish brown. The B horizon ranges from strongly acid to slightly acid in reaction. The depth to the underlying sand and gravel ranges from 20 to 40 inches.

Fox loam, 0 to 2 percent slopes (FmA).—This soil occurs in the valleys of the St. Joseph River and Cedar Creek, near Huntertown. Included in mapping were small areas of a brown soil and small areas of sandy loam or silt loam.

Droughtiness is the major limitation. Corn, soybeans, small grain, and hay are suitable crops. Deep-rooted legumes and fall-seeded small grain are better suited than corn, soybeans, and spring-seeded small grain, which are likely to be damaged if rainfall is below average or is poorly distributed. These crops respond to lime and fertilizer. (Capability unit IIs–1; woodland group 1)

Fox loam, 2 to 6 percent slopes (FmB).—Included with this soil in mapping were small areas of a lighter colored, eroded soil and small areas of silt loam or sandy loam.

Droughtiness is the major limitation. Corn, soybeans, small grain, and hay are suitable crops. Deep-rooted legumes and fall-seeded small grain are better suited than corn, soybeans, and spring-seeded small grain, which are likely to be damaged if rainfall is below average or is poorly distributed. These crops respond to lime and fertilizer. (Capability unit IIe–9; woodland group 1)

Fox loam, 6 to 12 percent slopes, moderately eroded (FmC2).—This soil is on short slopes along drainageways and above terrace breaks or escarpments. Erosion has removed 4 to 8 inches of the original surface layer. Included with this soil in mapping were small areas where the reddish-brown subsoil is exposed and a few small areas of a slightly eroded soil.

Like the other Fox soils, this soil is droughty, but erosion is the major hazard. Corn, soybeans, small grain, and hay are suitable crops. Deep-rooted legumes and fall-seeded small grain are better suited than corn, soybeans, and spring-seeded small grain, which are likely to be damaged in seasons when rainfall is below average or is poorly distributed. These crops respond to lime and fertilizer. (Capability unit IIIe–9; woodland group 1)

Genesee Series

The Genesee series consists of deep, well-drained, nearly level soils. These soils are on bottom lands. The native vegetation was hardwood forest.

Genesee soils have a 10-inch surface layer of dark grayish-brown, friable silt loam underlain by more than 36 inches of friable loam that is dark yellowish brown in the uppermost 20 inches and yellowish brown in the lower part. Below a depth of 46 inches is calcareous material.

These soils are subject to flooding and streambank erosion. Corn and soybeans are the principal crops. The areas that are only occasionally flooded are suited to small grain and legumes, but the crops are sometimes damaged. The areas that are frequently flooded for prolonged periods are not suited to these crops. Crops respond well to fertilizer.

Profile of Genesee silt loam in a cultivated field in the SW¼SW¼ sec. 2, T. 30 N., R. 13 E.

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable when moist; neutral; low to moderate organic-matter content; abrupt, smooth boundary.

C1—10 to 30 inches, dark yellowish-brown (10YR 4/4) loam; weak, medium, subangular blocky structure; friable when moist; neutral; clear, wavy boundary.

C2—30 to 46 inches, yellowish-brown (10YR 5/6) loam; weak, medium, subangular blocky structure; neutral; friable; clear, irregular boundary.

C3—46 to 55 inches, yellowish-brown (10YR 5/6) loam to silt loam; weak, medium and coarse, subangular blocky structure; friable when moist; calcareous.

The A horizon ranges from loam to silty clay loam in texture. In some places a few thin lenses of sand are in the lower part of the C horizon. In some places there are faint mottles at depths of more than 25 inches. Along some small streams, clay loam (glacial till) occurs at a depth of 38 to 45 inches.

Genesee loam (0 to 2 percent slopes) (Ge).—Although subject to flooding and to streambank erosion, this soil is well suited to corn and soybeans. Areas not flooded frequently or for prolonged periods are suited to small grains and legumes. These crops respond well to fertilization and other good management practices. (Capability unit I–2; woodland group 3)

Genesee silt loam (0 to 2 percent slopes) (Gh).—Included with this soil in mapping were small areas that have slopes of more than 3 percent.

Although subject to flooding and to streambank erosion, this Genesee soil is well suited to corn and soybeans. Areas not flooded frequently or for prolonged periods are suited to small grain and legumes. These crops respond well to fertilization and to other good management practices. Small, narrow, and irregularly shaped areas are commonly used for bluegrass pasture or woodland. (Capability unit I–2; woodland group 3)

Genesee silty clay loam (0 to 2 percent slopes) (Gm). Included with this soil in mapping were small areas of a very dark grayish-brown soil.

Although subject to flooding and to streambank erosion, this Genesee soil is well suited to corn and soybeans. Areas not flooded frequently or for prolonged periods are suited to small grain and legumes. These crops respond well to fertilization and other good management practices. Small, narrow, and irregularly shaped areas are commonly used for bluegrass pasture or woodland. (Capability unit I–2; woodland group 3)

Genesee fine sandy loam, sandy variant (0 to 2 percent slopes) (Gn).—This soil is on natural levees near streams. The surface layer is underlain generally by fine sandy loam or sandy loam and in places by thin lenses of sand, gravel, silt, or clay. Included with this soil in mapping were a few small areas of sandy and gravelly riverwash.

Even though droughty in abnormally dry periods and flooded occasionally, this soil is suited to meadow crops, corn, soybeans, and small grain. These crops respond well to fertilizer. Floods do not damage crops much, because water drains away quickly. (Capability unit I–2; woodland group 3)

Gilford Series

The Gilford series consists of deep, very poorly drained, nearly level and depressional soils. The native vegetation consisted of hardwood trees and marsh grass.

Gilford soils have a 14-inch surface layer of very dark brown, friable fine sandy loam mottled with strong brown

in the lower 7 inches. The 35-inch subsoil is gray, friable fine sandy loam mottled with strong brown and yellowish brown. This layer has a few $\frac{1}{4}$- to $\frac{1}{2}$-inch lenses of silty clay loam in the lowermost 18 inches. The underlying material is gray, very friable, calcareous sand mottled with strong brown.

Wetness is the major limitation. Adequately drained areas are well suited to the crops commonly grown in the county. Crops respond well to fertilizer.

Profile of Gilford fine sandy loam in a cultivated field in the SW¼SW¼SE¼ sec. 24, T. 32 N., R. 11 E.

Ap—0 to 7 inches, very dark brown (10YR 2/2) fine sandy loam; weak, medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

A1—7 to 14 inches, very dark brown (10YR 2/2) fine sandy loam; few, fine, faint mottles of strong brown (7.5YR 5/6); weak, medium, granular structure; friable when moist; neutral; gradual, wavy boundary.

B21g—14 to 31 inches, gray (10YR 5/1) fine sandy loam; common, fine, distinct mottles of strong brown (7.5YR 5/6); weak to moderate, medium, subangular blocky structure; friable when moist; neutral; clear, wavy boundary.

B22g—31 to 49 inches, gray (10YR 6/1) fine sandy loam; few, fine, faint mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable when moist; few thin seams of silty clay loam ¼ to ½ inch thick; neutral; gradual, wavy boundary.

IIC—49 to 60 inches, gray (10YR 6/1) sand; many mottles of strong brown (7.5YR 5/6); single grain; very friable when moist; calcareous.

The A horizon ranges from 10 to 18 inches in thickness. In some places the B horizon is sandy loam, and in places the C horizon contains thin lenses of fine sand, silt, or gravel.

Gilford fine sandy loam (0 to 2 percent slopes) (Go).—Included with this soil in mapping were small areas of muck.

Wetness is the major limitation. Drained areas are well suited to meadow crops, corn, soybeans, and small grain. These crops respond well to fertilization and to other good management practices. (Capability unit IIw–4; woodland group 4)

Gravel Pits

Gravel pits (Gp) have been dug in areas of Martinsville, Fox, Belmore, and other soils that have a sandy and gravelly substratum. Most of them are no longer used. Some pits that are permanently filled with water are used for fish ponds and other recreational purposes. (Not placed in a capability unit; not placed in a woodland group)

Haskins Series

The Haskins series consists of deep, somewhat poorly drained, nearly level and gently sloping soils. The native vegetation was hardwood forest.

Haskin soils have a 9-inch surface layer of dark grayish-brown, friable loam. The 24-inch subsoil consists of dark yellowish-brown, friable loam mottled with light brownish gray in the uppermost 3 inches; of light brownish-gray, firm sandy clay loam mottled with yellowish brown in the middle 10 inches; and of yellowish-brown, very firm clay mottled with light brownish gray and yellowish brown in the lower 11 inches. The underlying material is yellowish-brown, very firm, calcareous clay loam mottled with gray.

Wetness is the major limitation. Drained areas are suited to crops. Crops respond well to lime and fertilizer.

Profile of a Haskins loam in a cultivated field in the NW¼NW¼ sec. 32, T. 32 N., R. 14 E.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loam; weak, fine and medium, granular structure; friable when moist; slightly acid; clear, smooth boundary.

B1—9 to 12 inches, dark yellowish-brown (10YR 4/4) loam; many, coarse, distinct mottles of light brownish gray (10YR 6/2); weak, fine, subangular blocky structure; friable when moist; strongly acid; clear, smooth boundary.

B21t—12 to 14 inches, light brownish-gray (10YR 6/2) sandy clay loam; common, medium, faint mottles of yellowish brown (10YR 5/4); weak, fine, subangular blocky structure; firm when moist; thin clay films on few ped faces; strongly acid; clear, wavy boundary.

B22t—14 to 22 inches, light brownish-gray (10YR 6/2) sandy clay loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/8); moderate, medium, angular blocky structure; firm when moist; clay films on numerous ped faces; strongly acid; clear, wavy boundary.

IIB23t—22 to 33 inches, yellowish-brown (10YR 5/4) light clay; common, medium, distinct mottles of light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8); strong, coarse, angular blocky structure; very firm when moist; clay films on many ped faces; neutral; clear, wavy boundary.

C—33 to 42 inches, yellowish-brown (10YR 5/6) clay loam; many, medium, faint mottles of gray or light gray (10YR 6/1); moderate, coarse, angular blocky structure; very firm when moist; calcareous.

In places there are lenses of sand and gravel in the lower part of the B horizon and in the C horizon. The C horizon ranges from clay loam to clay in texture. The depth to calcareous material is most commonly about 32 inches.

Physical and chemical data for three profiles of the Haskins soils have been published in Soil Survey Investigations Report No. 18 (8).

Haskins loam, 0 to 2 percent slopes (HaA).—Included with this soil in mapping were small areas of silt loam and small areas of stratified sand and silt over silty clay loam and clay.

Wetness is the major limitation. Drained areas are well suited to meadow crops and to corn, soybeans, and small grain. These crops respond well to lime and fertilizer. (Capability unit IIw–2; woodland group 2)

Haskins loam, 2 to 6 percent slopes (HaB).—Included are small areas of a moderately eroded soil and small areas of silt loam.

Wetness is the major limitation, but runoff and erosion are hazards. Corn, soybeans, small grain, and meadow crops are suitable. These crops respond well to lime and fertilizer. (Capability unit IIw–2; woodland group 2)

Hoytville Series

The Hoytville series consists of deep, very poorly drained, nearly level and depressional soils. These soils are on the Lake Maumee Plain and in adjacent areas. The native vegetation consisted of hardwood trees and marsh grass.

Hoytville soils have a 7-inch surface layer of very dark gray, firm silty clay mottled with yellowish brown and a 31-inch subsoil of dark grayish-brown, very firm silty clay mottled with strong brown and yellowish brown. The underlying material is yellowish-brown, firm, calcareous silty clay mottled with grayish brown and white.

Wetness is the major limitation. Drained areas are suited to crops. Crops respond well to fertilization and other good management practices.

Profile of Hoytville silty clay in a cultivated field in the SW¼SW¼ sec. 28, T. 31 N., R. 15 E.

Ap—0 to 7 inches, very dark gray (10YR 3/1) silty clay; weak, fine, granular structure; firm when moist; few, fine, faint mottles of yellowish brown (10YR 5/6); neutral; abrupt, smooth boundary.

B21g—7 to 15 inches, dark grayish-brown (2.5Y 4/2) silty clay; common, medium, distinct mottles of strong brown (7.5YR 5/6); moderate, medium, angular blocky structure; firm or very firm when moist; neutral; clear, wavy boundary.

B22g—15 to 25 inches, dark grayish-brown (2.5Y 4/2) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, prismatic structure breaking to strong, coarse, angular blocky structure; very firm when moist; neutral; clear, wavy boundary.

B23g—25 to 38 inches, dark grayish-brown (2.5Y 4/2) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6); moderate and strong, coarse, angular blocky structure; very firm when moist; few pebbles of glacial till; mildly alkaline; clear, wavy boundary.

C—38 to 41 inches, yellowish-brown (10YR 5/8) silty clay (glacial till); many, medium, distinct mottles of grayish brown (2.5Y 5/2) and white (10YR 8/2); moderate, medium and coarse, angular blocky structure; firm when moist; calcareous.

In some places there are thin lenses of silt and sand in the lower part of the profile. The depth to the calcareous underlying material ranges from 35 to 55 inches.

Physical and chemical data for six profiles of the Hoytville soils have been published in Soil Survey Investigations Report No. 18 (8).

Hoytville silty clay (0 to 2 percent slopes) (Hs).—Wetness is the major limitation of this soil. Drained areas are suited to meadow crops, corn, soybeans, and small grain. These crops respond well to fertilization and other good management practices. (Capability unit IIw–1; woodland group 4)

Lenawee Series

The Lenawee series consists of deep, very poorly drained, nearly level and depressional soils. These soils are on the Lake Maumee Plain, in old glacial sluiceways, and on the terraces adjacent to the larger rivers, especially the St. Marys River. The native vegetation consisted of hardwood trees and marsh grass.

Lenawee soils have an 8-inch surface layer of very dark brown, firm silty clay loam. The uppermost 17 inches of the 37-inch subsoil consists of firm, mottled, dark grayish-brown silty clay loam over clay loam, and the lower 20 inches, of mottled grayish-brown sandy clay loam over silty clay loam. The underlying material is grayish-brown, firm, calcareous silty clay loam mottled with yellowish brown.

Wetness is the major limitation. Drained areas are well suited to crops. Crops respond well to fertilization and other good management practices.

Profile of Lenawee silty clay loam in a cultivated field in the SW¼NW¼ sec. 34, T. 30 N., R. 11 E.

Ap—0 to 8 inches, very dark brown (10YR 2/2) silty clay loam; moderate, fine and medium, granular structure; friable or firm when moist; neutral; abrupt, smooth boundary.

B21g—8 to 16 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; few or common, fine, faint mottles of dark yellowish brown (10YR 4/4 or 4/6); moderate, coarse, subangular blocky structure; firm when moist; neutral; gradual, wavy boundary.

IIB22g—16 to 25 inches, grayish-brown (10YR 5/2) to dark grayish-brown (2.5Y 4/2) clay loam; common, medium, distinct mottles of dark yellowish brown (10YR 4/4); moderate, medium and coarse, subangular blocky structure; firm when moist; neutral; gradual, wavy boundary.

B23g—25 to 35 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) sandy clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/6); weak, medium and coarse, subangular blocky structure; firm when moist; neutral; gradual, wavy boundary.

B3g—35 to 45 inches, grayish-brown (10YR 5/2) to brown (10YR 5/3) silty clay loam; mottles of gray (10YR 6/1) and yellowish brown (10YR 5/6); moderate, medium, subangular blocky structure; firm when moist; neutral; gradual, wavy boundary.

C—45 to 60 inches, grayish-brown (10YR 5/2) silty clay loam; mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure to massive; firm when moist; calcareous.

In places the A horizon is muck and is 3 to 12 inches thick. There is sand and gravel at a depth of more than 45 inches in places, particularly in the valley of the Little River. The depth to the calcareous underlying material is more than 33 inches.

Lenawee mucky silty clay loam (0 to 2 percent slopes) (Le).—This soil has a 3- to 12-inch surface layer of mucky material. It is in deep depressions and is surrounded by Lenawee silty clay loam.

Wetness is the major limitation. Drained areas are suited to meadow crops, corn, soybeans, and small grain. These crops respond well to fertilizer. Much of the undrained acreage is covered with swamp grass and willow and is used for recreational purposes and as wildlife habitat. (Capability unit IIw–1; woodland group 4)

Lenawee silty clay loam (0 to 2 percent slopes) (Ls). Included with this soil in mapping were small areas of loam or silt loam.

Wetness is the major limitation. Drained areas are well suited to meadow crops, corn, soybeans, and small grain. These crops respond well to fertilization and other good management practices. (Capability unit IIw–1; woodland group 4)

Linwood Series

The Linwood series consists of deep, very poorly drained, organic soils. These soils are in low depressions in the northern part of the county. The native vegetation consisted of hardwood trees, grasses, and sedges.

Linwood soils have a 9-inch surface layer of black, very friable muck. Below the surface layer is 15 inches of very friable muck that is very dark grayish brown in the uppermost 3 inches and dark reddish brown in the lower part. The underlying material is dark-gray silt in the upper part and firm, calcareous loam mottled with gray and brown in the lower part.

Wetness is the major limitation. Drained areas are well suited to crops. Crops respond well to fertilizer.

Profile of Linwood muck in a cultivated field in the SE¼NW¼SE¼ sec. 13, T. 32 N., R. 11 E.

1—0 to 9 inches, black (10YR 2/1) muck; moderate, fine, granular structure; very friable when moist; slightly acid; abrupt, smooth boundary.

2—9 to 12 inches, very dark grayish-brown (10YR 3/2) muck; few fragments of wood; weak, fine, granular structure; very friable when moist; slightly acid; clear, smooth boundary.

3—12 to 24 inches, dark reddish-brown (5YR 2/2) muck; weak, medium, subangular blocky structure; very friable when moist; neutral; clear, wavy boundary.

IIC1—24 to 27 inches, dark gray (10YR 4/1) or very dark gray (10YR 3/1) silty sedimentary material; neutral; clear, wavy boundary.

IIC2—27 to 44 inches, mottled gray (10YR 6/1) and brown (10YR 5/3) loam; massive; firm when moist; calcareous.

The muck ranges from strongly acid to neutral in reaction. The underlying material is at a depth of 12 to 42 inches. In some places there are small amounts of calcareous gravel just below the muck. In some places the texture of the IIC1 horizon is silty clay loam instead of silt.

Linwood muck (0 to 2 percent slopes) (Lw).—Wetness is the major limitation of this soil. Drained areas are well suited to corn, soybeans, and vegetables. These crops respond well to fertilization and to other good management. (Capability unit IIIw–8; woodland group 9)

Made Land

Made land (Ma) consists of areas where the soil has been disturbed enough to destroy the original profile. In these areas the soil material is a mixture of parent material and material from the original surface layer and subsoil. In some places this land also includes pits and other depressions used as dumps and then later covered with soil material.

Made land has no significant agricultural value. Some of it is used as sites for commercial buildings. (Capability unit VIIe–3; not placed in a woodland group)

Martinsville Series

The Martinsville series consists of deep, well-drained, nearly level to moderately sloping soils. These soils are on terraces along the major streams, on beach ridges in the Lake Maumee Plain and in the valley of the Little River, and on outwash plains in the uplands near Huntertown. The native vegetation was hardwood forest.

Martinsville soils have a 13-inch surface layer of friable loam that is dark grayish brown in the uppermost 9 inches and grayish brown in the lower part. The 35-inch subsoil is yellowish-brown and reddish-brown, friable and firm sandy clay loam in the uppermost 22 inches and reddish-brown, friable fine sandy loam in the lower 13 inches. The underlying material is yellowish-brown, friable, calcareous fine sand that contains thin lenses of silt and a few pebbles.

Erosion is the major hazard, and controlling runoff is a problem. Areas that are not severely eroded are suited to the crops commonly grown. Crops respond well to lime and fertilizer.

Profile of a Martinsville loam in a cultivated field west of the county road in the SW¼SW¼ sec. 9, T. 32 N., R. 12 E.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) loam; moderate, fine and medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

A2—9 to 13 inches, grayish-brown (10YR 5/2) light loam; weak, fine and medium, granular structure; friable when moist; medium acid; clear, smooth boundary.

B1t—13 to 20 inches, yellowish-brown (10YR 5/4) light sandy clay loam; weak, medium, subangular blocky structure; thin clay films on a few ped faces; friable when moist; medium acid; gradual, wavy boundary.

B2t—20 to 35 inches, reddish-brown (5YR 4/3) sandy clay loam; weak to moderate subangular blocky structure; thin clay films on many ped faces; firm when moist; strongly acid; gradual, wavy boundary.

B3—35 to 48 inches, reddish-brown (5YR 4/4) fine sandy loam; weak, medium, subangular blocky structure; friable when moist; slightly acid; clear, smooth boundary.

C—48 to 60 inches, yellowish-brown (10YR 5/4) fine sand that is stratified with thin layers of silt and that contains scattered fine pebbles to a depth of 60 inches; single grain or massive; friable when moist; calcareous.

The Ap or A1 horizon is loam or silt loam. In uncultivated areas, the A1 horizon is very dark grayish brown in places. The upper part of the B horizon is silty clay loam to sandy clay loam, and the lower part is clay loam, sandy clay loam, or fine sandy loam. The underlying material is generally fine sand, silt, or stratified sand and silt, but in some places north of New Haven it is silty clay loam. The depth to the calcareous material ranges from 30 to more than 60 inches.

Martinsville loam, 0 to 2 percent slopes (McA).—Included with this soil in mapping were small areas of Martinsville loam, 2 to 6 percent slopes, moderately eroded.

Martinsville loam, 0 to 2 percent slopes, is well suited to corn, soybeans, oats, wheat, and alfalfa. These crops respond well to lime and fertilizer. A few small areas are woodland or pasture. (Capability unit I–1; woodland group 1)

Martinsville loam, 2 to 6 percent slopes (McB).—Even though erosion is a moderate hazard, this soil is well suited to corn, soybeans, oats, wheat, and alfalfa. These crops respond well to lime and fertilizer. (Capability unit IIe–1; woodland group 1)

Martinsville loam, 2 to 6 percent slopes, moderately eroded (McB2).—Erosion has removed 25 to 75 percent of the original surface layer of this soil, and plowing has mixed what remains of the surface layer with part of the yellowish-brown subsoil. The resulting plow layer is low in content of organic matter and in supply of plant nutrients. Included with this soil in mapping were small areas from which more than 75 percent of the surface layer has been removed.

Even though erosion is a moderate hazard, this Martinsville soil is suited to corn, soybeans, oats, wheat, and alfalfa. These crops respond well to lime and fertilizer. Preparing a seedbed is difficult because the soil tends to clod. (Capability unit IIe–1; woodland group 1)

Martinsville loam, 6 to 12 percent slopes, moderately eroded (McC2).—Erosion has removed 25 to 75 percent of the original surface layer of this soil, and plowing has mixed what remains of the surface layer with part of the yellowish-brown subsoil. The resulting plow layer is low in content of organic matter and in supply of plant nutrients. Included with this soil in mapping were small slightly eroded areas.

Even though erosion and droughtiness are limitations, this Martinsville soil is suited to corn, soybeans, oats, wheat, and alfalfa. Preparing a seedbed is difficult because clods form easily in many places. Lime and fertilizer are needed. (Capability unit IIIe–1; woodland group 1)

Martinsville loam, gravelly substratum, 0 to 2 percent slopes (MeA).—This soil occurs mainly near New Haven and Waynedale (a suburb of Fort Wayne) and in the townships of Cedar Creek, Perry, and Eel River. Included in mapping were small areas of silt loam.

This Martinsville soil is well suited to corn, soybeans, oats, wheat, and alfalfa. Corn and soybeans are the crops most commonly grown. These crops respond well to lime and fertilizer. (Capability unit I–1; woodland group 1)

Martinsville loam, gravelly substratum, 2 to 6 percent slopes (MeB).—Even though erosion is a moderate hazard, this soil is well suited to corn, soybeans, oats, wheat, and alfalfa. These crops respond well to lime and fertilizer. (Capability unit IIe–1; woodland group 1)

Martinsville silt loam, 0 to 2 percent slopes (MfA).—In this soil the upper part of the B horizon is silty clay loam. Included in mapping were small areas from which 4 to 8 inches of the original surface layer has been removed by erosion.

This soil is well suited to corn, soybeans, oats, wheat, and alfalfa. These crops respond well to lime and fertilizer. (Capability unit I–1; woodland group 1)

Martinsville soils, 6 to 12 percent slopes, severely eroded (MgC3).—Erosion has removed more than 75 percent of the original surface layer of these soils and, in many places, part of the subsoil. In some areas gullies are common. As a result of erosion, natural fertility is very low and the content of organic matter is low.

In part of this complex, the soils have a clayey surface layer, and in part they have a loamy surface layer. The two kinds of soils occur in such an intricate pattern that it was not practical to map them separately. Included in mapping were small areas where the slope is less than 6 percent and some areas where it is more than 12 percent.

These soils are suitable for hay or pasture crops and for small grain. Tilth is poor. Lime and fertilizer are needed. (Capability unit IVe–1; woodland group 1)

Mermill Series

The Mermill series consists of deep, poorly drained, nearly level and depressional soils. The native vegetation consisted of hardwood trees and marsh grass.

Mermill soils have a 10-inch surface layer that is black, friable loam in the uppermost 6 inches and very dark gray, firm clay loam in the lower part. The 34-inch subsoil is mostly dark-gray or grayish-brown, firm clay loam mottled with yellowish brown, dark brown, and gray. The underlying material is grayish-brown, extremely firm, calcareous silty clay mottled with dark grayish brown and yellowish brown.

Wetness is the major limitation. Drained areas are well suited to crops. Crops respond well to fertilization and other good management.

Profile of a Mermill loam in an area recently cleared of timber in the NW¼SE¼NE¼ sec. 21, T. 31 N., R. 14 E.

O1—½ inch to 0, fibrous material, twigs, and other organic matter; neutral.

A11—0 to 6 inches, black (10YR 2/1) loam to light clay loam; moderate, medium, granular structure; friable when moist; many undecomposed tree roots; neutral; abrupt, smooth boundary.

A12—6 to 10 inches, very dark gray (10YR 3/1) clay loam; moderate, fine and medium, subangular blocky structure; slightly firm when moist; gradual, wavy boundary.

B21g—10 to 19 inches, dark-gray (10YR 4/1) clay loam; common, fine, faint mottles of yellowish brown (10YR 5/4); moderate, medium, subangular blocky structure; firm when moist; slightly acid; gradual, wavy boundary.

B22g—19 to 25 inches, grayish-brown (10YR 5/2) clay loam; common or many, distinct mottles of yellowish brown (10YR 5/6) and dark brown (7.5YR 4/4); moderate, medium, subangular blocky structure; firm when moist; slightly acid; gradual, wavy boundary.

B23g—25 to 35 inches, grayish-brown (10YR 5/2) clay loam; many mottles of yellowish brown (10YR 5/6) and dark brown (7.5YR 4/4); weak, medium, subangular blocky structure; very firm when moist; slightly acid; gradual, wavy boundary.

B24g—35 to 40 inches, yellowish-brown (10YR 5/8) clay loam; many, medium, distinct mottles of gray (10YR 5/1) and light brownish gray (10YR 6/2); weak, medium, subangular blocky structure; firm when moist; slightly acid; clear, wavy boundary.

B3g—40 to 44 inches, mottled light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/8), and light yellowish-brown (10YR 6/4) sandy clay loam; weak, medium, subangular blocky structure; friable or firm when moist; neutral; abrupt, smooth boundary.

IIC—44 to 60 inches, grayish-brown (10YR 5/2) silty clay; compact till; many, medium mottles of dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4); massive; extremely firm when moist; calcareous.

The A horizon ranges from loam to silty clay loam in texture and from 10 to 14 inches in thickness. The C horizon ranges from clay loam to clay in texture.

Mermill complex (0 to 2 percent slopes) (Mh).—The soils in this complex have a surface layer of loam, silt loam, clay loam, or silty clay loam.

Wetness is the major limitation. Drained areas are well suited to meadow crops, corn, soybeans, and small grain. These crops respond well to fertilization and other good management practices. (Capability unit IIw–1; woodland group 4)

Miami Series

The Miami series consists of deep, well-drained, gently sloping and strongly sloping soils. These soils are on uplands, mostly in the northwestern part of the county. The native vegetation was hardwood trees.

Miami soils have an 8-inch surface layer of brown, friable loam and a 20-inch subsoil that is yellowish-brown, friable loam in the uppermost 5 inches and firm silty clay loam or clay loam in the lower part. The underlying material is pale-brown, firm, calcareous loam.

Erosion is the major hazard, and controlling runoff is a problem. Areas that are not severely eroded are suited to the crops commonly grown. Crops respond well to lime and fertilizer.

Profile of a moderately eroded Miami loam in a cultivated field at a point 742 feet south and 990 feet east of the northwest corner of sec. 22, T. 32 N., R. 11 E.

Ap—0 to 8 inches, brown (10YR 5/3) loam; moderate, medium, granular structure; friable when moist; slightly acid; abrupt, smooth boundary.

B1—8 to 13 inches, yellowish-brown (10YR 5/4) heavy loam; weak to moderate, medium, subangular blocky structure; friable or firm when moist; medium acid; clear, smooth boundary.

B21t—13 to 18 inches, dark yellowish-brown (10YR 4/4) silty clay loam; moderate, medium, angular blocky structure; thin, dark-brown (10YR 4/3) clay films on many ped faces; firm when moist; slightly acid; clear, wavy boundary.

B22t—18 to 24 inches, dark yellowish-brown (10YR 4/4) clay loam; medium, coarse, angular blocky structure; thin, dark-brown (10YR 4/3) or brown (10YR 5/3) clay

films on many ped faces; firm when moist; slightly acid; clear, wavy boundary.

B3—24 to 28 inches, yellowish-brown (10YR 5/4) loam to light clay loam; weak to moderate, angular blocky structure; thin, dark-brown (10YR 4/3) clay films on few ped faces; slightly firm when moist; neutral; clear, wavy boundary.

C—28 to 42 inches, pale-brown (10YR 6/3) loam; weak, coarse, prismatic structure breaking to moderate, coarse, angular blocky structure; organic films or thin clay films on peds; slightly firm when moist; calcareous.

The A horizon ranges from loam to silt loam in texture. The depth to calcareous material ranges from 20 to 42 inches.

Miami loam, 2 to 6 percent slopes, moderately eroded (MkB2).—Erosion has removed 2 to 7 inches of the original surface layer of this soil, and in some places the present surface layer is silt loam. Included with this soil in mapping were small areas of a severely eroded soil, of a slightly eroded soil, and of a soil that contains gravel.

Erosion is the major hazard, and controlling runoff is a problem. Corn, soybeans, small grain, and hay are well suited. These crops respond well to lime and fertilizer. Because this soil occupies such small areas, it is generally managed the same as adjoining soils. (Capability unit IIe–1; woodland group 1)

Miami silt loam, 6 to 12 percent slopes, moderately eroded (MlC2).—Erosion has removed 2 to 7 inches of the original surface layer of this soil. Included in mapping were small areas of loam, of a slightly eroded soil, of a severely eroded soil, and of a soil that has slopes of more than 12 percent.

Erosion is the major hazard, and controlling runoff is a problem. Corn, soybeans, small grain, and hay are suitable crops. These crops respond well to lime and fertilizer. (Capability unit IIIe–1; woodland group 1)

Miami soils, 6 to 12 percent slopes, severely eroded (MmC3).—Erosion has removed more than 75 percent of the original surface layer of these soils and, in many places, part of the subsoil. Severe gullying has occurred in some small areas, and the limy underlying material has been exposed in places. The soils have a surface layer of loam, silt loam, or silty clay loam. Most areas have a combination of surface textures. Included in mapping were small areas that have slopes of more than 12 percent.

Erosion is the major hazard, and controlling runoff is a problem. Natural fertility is low, the organic-matter content is low, and tilth is poor. Meadow crops, permanent pasture, and small grain are suitable crops. These crops respond well to lime and fertilizer. (Capability unit IVe–1; woodland group 1)

Montgomery Series

The Montgomery series consists of deep, very poorly drained, nearly level soils. These soils are on flats and in depressions on the Lake Maumee Plain and in old glacial sluiceways. The native vegetation consisted of hardwood trees and marsh grass.

Montgomery soils have a 10-inch surface layer of black, firm silty clay or silty clay loam and a 36-inch subsoil of gray and dark-gray, very firm silty clay mottled with dark brown and yellowish brown. The underlying material is yellowish-brown silty clay or clay mottled with dark brown. This layer contains a few lenses of silt. It is calcareous in the lower part.

Wetness is the major limitation. Drained areas are well suited to the common crops. Crops respond well to fertilizer.

Profile of Montgomery silty clay in a cultivated field in the SE¼NW¼ sec. 33, T. 30 N., R. 11 E.

Ap1—0 to 7 inches, black (10YR 2/1) silty clay; many fibrous roots; fine, subangular blocky structure; firm when moist; neutral; clear, wavy boundary.

Ap2—7 to 10 inches, black (10YR 2/1) silty clay; strong, fine and medium, angular blocky structure; firm when moist; neutral; clear, wavy boundary.

B21g—10 to 24 inches, gray (10YR 5/1) silty clay; common, fine, distinct mottles of dark brown (7.5YR 4/4); strong, coarse, angular blocky structure; very firm when moist; neutral; gradual, wavy boundary.

B22g—24 to 46 inches, gray (N 5/0 or 5Y 5/1) and dark-gray (5Y 4/1) silty clay; many, medium, distinct mottles of dark brown (7.5YR 4/4) and yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; firm when moist; thin clay films of gray (5Y 5/1) on numerous ped faces; mildly alkaline; gradual, wavy boundary.

C1—46 to 64 inches, yellowish-brown (10YR 5/6) silty clay or clay and thin layers of silt; many, medium, distinct mottles of dark brown (7.5YR 4/4); massive; very firm when moist; moderately alkaline.

C2—64 to 72 inches, yellowish-brown (10YR 5/6) silty clay or clay; calcareous.

The A horizon ranges from 10 to 15 inches in thickness and from silty clay loam to silty clay in texture. The depth to calcareous material ranges from 36 to 75 inches. In some places there are thin lenses of sand or silt in the lower part of the B horizon and in the C horizon. In other places a few pebbles, 15 to 25 millimeters in diameter, are in the lower part of the profile.

Montgomery silty clay (0 to 2 percent slopes) (Mn).—Wetness is the major limitation of this soil. Drained areas are well suited to corn, soybeans, small grain, and meadow. These crops respond well to fertilization and other good management practices. Fall-planted small grain is occasionally damaged severely by excessive wetness or frost heave. (Capability unit IIIw–2; woodland group 4)

Montgomery silty clay loam (0 to 2 percent slopes) (Mo).—Wetness is the major limitation of this soil. Drained areas are suited to corn, soybeans, small grain, and meadow. These crops respond well to fertilization and other good management practices. Fall-planted small grain is occasionally damaged severely by excessive wetness or frost heave. (Capability unit IIIw–2; woodland group 4)

Morley Series

The Morley series consists of deep, moderately well drained, gently sloping to steep soils on uplands. The native vegetation was hardwood forest.

Morley soils have a 6-inch surface layer of friable silt loam that is very dark grayish brown in the uppermost 3 inches and grayish brown in the lower part. The 18-inch subsoil is mostly dark yellowish-brown and brown, very firm clay mottled with yellowish brown in the lower part.

The underlying material is dark grayish-brown, firm, calcareous clay loam (fig. 6).

Erosion is the major hazard, and controlling runoff is a problem. Generally, areas that have slopes of less than 12 percent are suited to all the commonly grown crops, and the other areas are suited to fewer crops as the slope becomes steeper and the degree of erosion greater. Crops respond well to lime and fertilizer.

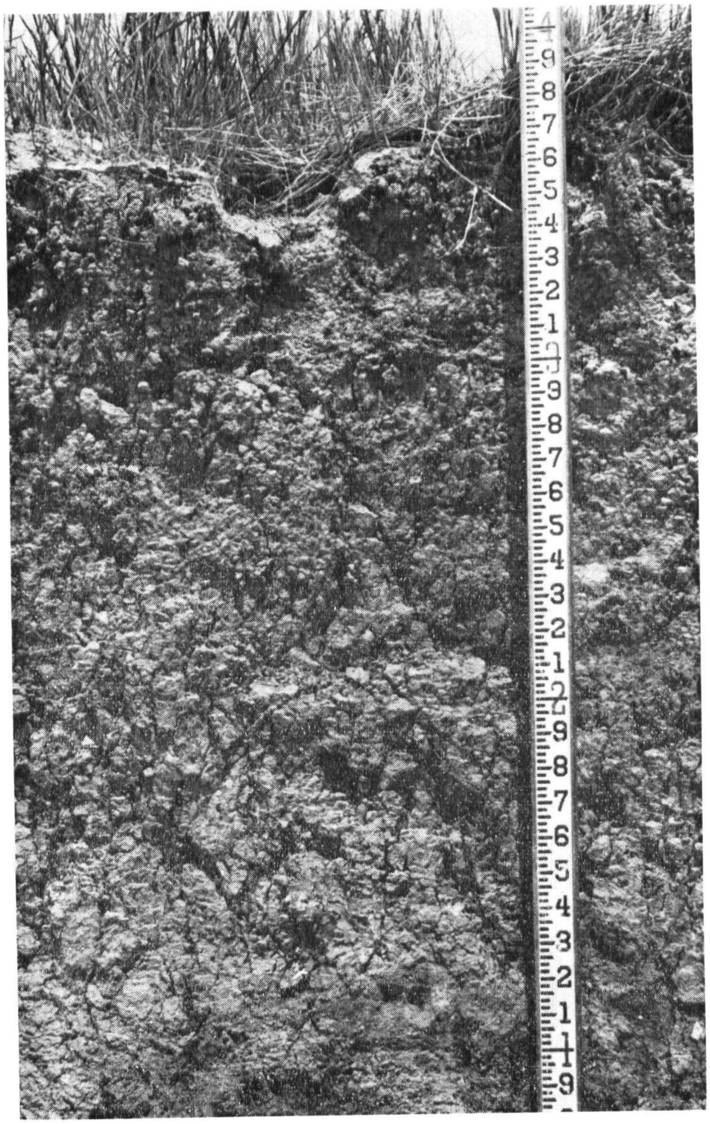

Figure 6.—**Profile of Morley silt loam, 2 to 6 percent slopes.**

Profile of a Morley silt loam, 742 feet south and 990 feet east of the northwest corner of sec. 5, T. 32 N., R. 15 E.

A1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; strong, fine, granular structure; friable when moist; many fibrous roots; medium acid; clear, smooth boundary.

A2—3 to 6 inches, grayish-brown (10YR 5/2) silt loam; weak, medium, platy structure; friable when moist; strongly acid; clear, smooth boundary.

B1—6 to 9 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, fine, subangular blocky structure; friable or firm when moist; strongly acid; clear, smooth boundary.

B21t—9 to 16 inches, dark yellowish-brown (10YR 4/4) clay; weak, medium, prismatic structure breaking to moderate, medium, angular blocky structure; very firm when moist; thin clay films of dark grayish brown (10YR 4/2) on many ped faces; strongly acid; clear, wavy boundary.

B22t—16 to 24 inches, brown to dark-brown (10YR 4/3) clay; few, medium, faint mottles of yellowish brown (10YR 5/4 to 5/6); moderate to weak, medium, prismatic structure breaking to moderate, medium, angular blocky structure; very firm when moist; thin clay films on many ped faces; slightly acid; clear, wavy boundary.

C—24 to 42 inches, dark grayish-brown (10YR 4/2) clay loam (glacial till); few, medium, faint mottles of yellowish brown (10YR 5/4); moderate, medium, angular blocky structure; firm when moist; calcareous.

The A horizon is 6 to 10 inches thick in only slightly eroded soils. The depth to calcareous material ranges from 18 to 36 inches.

Physical and chemical data for two profiles of the Morley soils have been published in Soil Survey Investigations Report No. 18 (8).

Morley silt loam, 2 to 6 percent slopes (MrB).—Included with this soil in mapping were a few small areas of loam.

Erosion is the major hazard, and controlling runoff is a problem. Corn, soybeans, small grain, and hay are well suited. These crops respond well to lime and fertilizer. (Capability unit IIe-6; woodland group 1)

Morley silt loam, 2 to 6 percent slopes, moderately eroded (MrB2).—The surface layer of this soil is only 3 to 6 inches thick. Included in mapping were a few small areas of a light-colored silty clay loam.

Erosion is the major hazard, and controlling runoff is a problem. Corn, soybeans, small grain, and hay are well suited. These crops respond well to lime and fertilizer. (Capability unit IIe-6; woodland group 1)

Morley silt loam, 6 to 12 percent slopes (MrC).—Included with this soil in mapping were small areas of loam.

Erosion is the major hazard, and controlling runoff is a problem. Corn, soybeans, small grain, and hay are well suited. These crops respond well to lime and fertilizer. (Capability unit IIIe-6; woodland group 1)

Morley silt loam, 6 to 12 percent slopes, moderately eroded (MrC2).—The surface layer of this soil is only 3 to 6 inches thick. In places it is lighter colored than it was originally because it has been mixed with subsoil material.

Erosion is the major hazard, and controlling runoff is a problem. Corn, soybenas, small grain, and hay are suitable crops. These crops respond well to lime and fertilizer. (Capability unit IIIe-6; woodland group 1)

Morley silt loam, 12 to 18 percent slopes, moderately eroded (MrD2).—The surface layer of this soil is only 3 to 6 inches thick.

Erosion is the major hazard, and controlling runoff is a problem. Small grain, hay, and permanent pasture are suitable crops. These crops respond well to lime and fertilizer. (Capability unit IVe-6; woodland group 8)

Morley silt loam, 18 to 25 percent slopes, moderately eroded (MrE2).—The surface layer of this soil is only 3 to 6 inches thick. Included in mapping were small areas that have slopes of more than 25 percent and some in which the yellowish-brown subsoil is exposed.

Erosion is the major hazard, and controlling runoff is a problem. Permanent pasture is a suitable use for this soil. It responds well to lime and fertilizer. (Capability unit VIe-1; woodland group 8)

Morley soils, 2 to 6 percent slopes, severely eroded (MsB3).—The plow layer of these soils ranges from silt loam to silty clay loam in texture. Less than 3 inches of the original surface layer remains, and in most places yellowish-brown silty clay loam that was originally part of the subsoil is exposed. Included with these soils in mapping were small areas where limy material is exposed and a few areas that are gullied.

Erosion is the major hazard, and controlling runoff is a problem. Corn, soybeans, small grain, and hay are suitable crops. These crops respond well to lime and fertilizer. (Capability unit IIIe–6; woodland group 1)

Morley soils, 6 to 12 percent slopes, severely eroded (MsC3).—The plow layer of these soils ranges from silt loam to silty clay loam in texture, but it consists mainly of yellowish-brown silty clay loam that was originally part of the subsoil. Less than 3 inches of the original surface layer remains. Some areas are gullied.

Erosion is the major hazard, and controlling runoff is a problem. Small grain, hay, and permanent pasture are suitable crops. These crops respond well to lime and fertilizer. (Capability unit IVe–6; woodland group 8)

Morley soils, 12 to 18 percent slopes, severely eroded (MsD3).—The plow layer of these soils ranges from silt loam to silty clay loam in texture. In many places it consists partly of yellowish-brown silty clay loam that was originally part of the subsoil. Less than 3 inches of the original surface layer remains. Some areas are traversed by gullies 18 to 24 inches deep.

Erosion is the major hazard, and controlling runoff is a problem. Permanent pasture is a suitable use for this soil. Pasture responds to lime and fertilizer. (Capability unit VIe–1; woodland group 8)

Morley soils, 18 to 25 percent slopes, severely eroded (MsE3).—The plow layer of these soils ranges from silty clay loam to silt loam in texture, but the present plow layer is commonly silty clay loam. Less than 3 inches of the original surface layer remains. Included with these soils in mapping were small gullied areas and areas where the soil material at the surface is limy.

These Morley soils are not suitable for cultivation. Erosion is the major hazard, and controlling runoff is a problem. (Capability unit VIIe–1; woodland group 8)

Nappanee Series

The Nappanee series consists of deep, somewhat poorly drained, nearly level soils. The soils are on the Lake Maumee Plain and in adjacent areas. The native vegetation was hardwood forest.

Nappanee soils have a 6-inch surface layer of friable silt loam that is very dark gray in the uppermost 3 inches and grayish brown in the lower part. The uppermost 2 inches of the 27-inch subsoil is grayish-brown, mottled, firm silty clay loam, and the rest is grayish-brown, mottled, very firm clay. The underlying material is grayish-brown, very firm, calcareous silty clay mottled with yellowish brown and light gray.

Wetness is the major limitation. Drained areas are suited to permanent pasture and to corn, soybeans, small grain, and hay. These crops respond well to fertilizer.

Profile of Nappanee silt loam in the NE¼SW¼ sec. 4, T. 31 N., R. 15 E.

A1—0 to 3 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, granular structure; friable when moist; medium acid; abrupt or clear, smooth boundary.

A2—3 to 6 inches, grayish-brown (10YR 5/2) silt loam; strong, medium, platy structure; friable when moist; strongly acid to medium acid; clear, smooth boundary.

B1—6 to 8 inches, grayish-brown (2.5Y 5/2) silty clay loam; few, medium, faint mottles of yellowish brown (10YR 5/6); strong, fine, subangular blocky structure; firm when moist; strongly acid; clear, smooth boundary.

B21t—8 to 27 inches, grayish-brown (2.5Y 5/2) clay; common, medium, distinct mottles of yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4); weak to moderate, medium, prismatic structure breaking to strong, medium, angular blocky structure; thin clay films on many ped faces; very firm when moist; strongly acid; gradual, wavy boundary.

B22t—27 to 33 inches, grayish-brown (2.5Y 5/2) clay; common, medium, distinct mottles of yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4); strong, medium, angular blocky structure; very firm when moist; thin clay films on numerous ped faces; medium acid or slightly acid; gradual, wavy boundary.

C—33 to 42 inches, grayish-brown (2.5Y 5/2) silty clay; common, medium, distinct mottles of yellowish brown (10YR 5/6) and light gray (10YR 7/2); moderate, medium, angular blocky structure; very firm when moist; calcareous.

In some cultivated areas, soil material from the B1 horizon is mixed with that of the plow layer, and in other places there is no B1 horizon. The depth to calcareous material ranges from 20 to 38 inches.

Physical and chemical data for two profiles of the Nappanee soils have been published in Soil Survey Investigations Report No. 18 (8).

Nappanee silt loam (0 to 2 percent slopes) (Na).—Included with this soil in mapping were a few small areas of a moderately eroded soil, a few areas of a very dark grayish-brown or black soil, and small areas of a soil that formed in clayey lacustrine deposits.

Wetness is the major limitation. Drained areas are suited to permanent pasture and to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. (Capability unit IIIw–6; woodland group 2)

Nappanee silty clay loam (0 to 2 percent slopes) (Np).—Included with this soil in mapping were small areas of a moderately eroded soil and small areas of a very dark grayish-brown or dark-brown soil.

Wetness is the major limitation. Drained areas are suited to permanent pasture and to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. Preparing a seedbed is difficult because of the clay in the surface layer. (Capability unit IIIw–6; woodland group 2)

Oshtemo Series

The Oshtemo series consists of deep, somewhat excessively drained, nearly level to moderately sloping soils. These soils are on terraces along major streams, on outwash plains near Huntertown, and in the valley of the Little River. The native vegetation was hardwood forest.

Oshtemo soils have a 16-inch surface layer of dark-brown, very friable sandy loam. The uppermost 17 inches of the 34-inch subsoil is yellowish-brown, very friable sandy loam; the middle 10 inches is brown, friable sandy loam; and the lowermost 7 inches is dark-brown or brown gravelly sandy loam. The underlying material is light brownish-gray, loose, calcareous sand and gravel.

Droughtiness is a limitation, and erosion is a hazard on slopes of more than 2 percent. The commonly grown crops are suited. Crops respond well to lime and fertilizer.

Profile of an Oshtemo sandy loam in a cultivated field in the SW¼ sec. 3, T. 31 N., R. 13 E.

Ap—0 to 10 inches, sandy loam, dark brown (10YR 3/3) when moist and light brownish gray (10YR 6/2) when dry; very weak, medium, granular structure; very friable when moist; slightly acid; clear, wavy boundary.

A2—10 to 16 inches, dark-brown or brown (10YR 4/3) sandy loam; very weak, medium, granular structure; very friable or loose when moist; medium acid; clear, wavy boundary.

B1t—16 to 33 inches, yellowish-brown (10YR 5/4) sandy loam; very weak, medium and coarse, subangular blocky structure; very friable when moist; thin, dark yellowish-brown (10YR 4/4) clay films bridging some sand grains and lining some of the pores; medium acid; clear, wavy boundary.

B21t—33 to 43 inches, brown (10YR 5/3) heavy sandy loam; weak, coarse, subangular blocky structure; friable when moist; thin, dark yellowish-brown (10YR 4/4) clay films bridging the sand grains and lining many of the pores; medium acid; gradual, wavy boundary.

B22t—43 to 50 inches, dark-brown to brown (10YR 4/3) gravelly sandy loam; weak, coarse, subangular blocky structure; friable or firm when moist; thin, dark yellowish-brown (10YR 4/4) clay films bridging the sand grains and lining many of the pores; medium acid; abrupt, wavy boundary.

C—50 to 65 inches, light brownish-gray (10YR 6/2) sand and gravel; single grain; loose when moist; calcareous.

The A horizon ranges from 12 to 18 inches in thickness and from sandy loam to fine sandy loam in texture. The depth to sand and gravel ranges from 42 inches to as much as 70 inches. In some places the soil material below a depth of 42 to 70 inches is stratified silt and sand.

Oshtemo fine sandy loam, loamy substratum, 0 to 2 percent slopes (OfA).—This soil occurs along the east side of the St. Joseph River and along the beach ridges on the edge of the Lake Maumee Plain. It is underlain by stratified silt and sand at a depth of 42 to 70 inches. Included with this soil in mapping were small areas of a moderately eroded soil.

Droughtiness is the major limitation. Unirrigated areas are suited to corn, soybeans, small grain, and hay. Irrigated areas are well suited to vegetables and other special crops. All of these crops respond well to fertilizer. (Capability unit IIIs–2; woodland group 7)

Oshtemo fine sandy loam, loamy substratum, 2 to 6 percent slopes (OfB).—This soil is underlain by stratified silt and sand at a depth of 42 to 70 inches. Included in mapping were small areas of loamy fine sand or sandy loam and small areas of a moderately eroded soil.

Erosion is the major hazard, and droughtiness is a limitation. Unirrigated areas are suited to corn, soybeans, small grain, and hay, and irrigated areas are well suited. These crops respond well to fertilizer. (Capability unit IIIe–13; woodland group 7)

Oshtemo fine sandy loam, loamy substratum, 6 to 12 percent slopes, moderately eroded (OfC2).—This soil is on terrace breaks that are adjacent to upland areas. It has a 4- to 8-inch surface layer and is underlain by stratified silt and sand at a depth of 42 to 70 inches. Included with this soil in mapping were a few small areas of a severely eroded, yellowish-brown soil and a few areas that have slopes of more than 12 percent.

Erosion is a hazard, and droughtiness is a limitation. Corn, soybeans, small grain, and permanent pasture are suitable crops. These crops respond well to fertilizer. (Capability unit IIIe–13; woodland group 7)

Oshtemo sandy loam, 0 to 2 percent slopes (OsA).—Included with this soil in mapping were small areas of fine sandy loam and small areas where the depth to sand and gravel is less than 42 inches.

Droughtiness is the major limitation. Unirrigated areas are suited to corn, soybeans, and small grain. Irrigated areas are well suited to these crops and to vegetables and other special crops. These crops respond well to fertilizer. (Capability unit IIIs–2; woodland group 7)

Oshtemo sandy loam, 2 to 6 percent slopes (OsB).—Included with this soil in mapping were small areas of fine sandy loam, a few small areas where the depth to sand and gravel is less than 42 inches, and a few small areas in cultivated fields where moderate erosion has exposed the brown subsoil.

Erosion is the major hazard, and droughtiness is a limitation. Unirrigated areas are suited to corn, soybeans, small grain, and hay. Irrigated areas are better suited to these crops. These crops respond well to fertilizer. (Capability unit IIIe–13; woodland group 7)

Pewamo Series

The Pewamo series consists of deep, very poorly drained, nearly level and depressional soils. These soils are on flats and in shallow depressions in the uplands. The native vegetation consisted of hardwood trees and marsh grass.

Pewamo soils have a 10-inch surface layer of very dark gray, firm silty clay loam. The uppermost 10 inches of the 40-inch subsoil is dark-gray, very firm silty clay mottled with yellowish brown, and the rest is dark grayish-brown or brown, mottled silty clay or silty clay loam. The underlying material is grayish-brown, very firm, calcareous clay loam mottled with dark yellowish brown.

Wetness is the major limitation. Drained areas are well suited to crops. Crops respond well to fertilizer.

Profile of Pewamo silty clay loam in a cultivated field in the SE¼SW¼ sec. 33, T. 29 N., R. 13 E.

Ap—0 to 10 inches, very dark gray (10YR 3/1) silty clay loam; weak, fine and medium, granular structure; firm when moist; slightly acid; abrupt, smooth boundary.

B21g—10 to 20 inches, dark-gray (10YR 4/1) light silty clay; common, fine, distinct mottles of yellowish brown (10YR 5/6); moderate, medium, angular blocky structure; very firm when moist; thin clay films on few ped faces; slightly acid or neutral; clear, wavy boundary.

B22g—20 to 29 inches, dark grayish-brown (2.5Y 4/2) silty clay; common, fine, distinct mottles of yellowish brown (10YR 5/6); strong, medium, angular blocky structure; very firm when moist; thin clay films on few ped faces; neutral; clear, wavy boundary.

B23g—29 to 38 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/8); strong, fine and medium, angular blocky structure; very firm when moist; neutral; clear, wavy boundary.

B24g—38 to 50 inches, grayish-brown (2.5Y 5/2) heavy silty clay loam; many, medium, distinct mottles of yellowish brown (10YR 5/8) and light olive brown (2.5Y 5/4); moderate, medium, angular blocky structure; very firm when moist; neutral; clear, wavy boundary.

C—50 to 60 inches, grayish-brown (2.5Y 5/2) clay loam; many, coarse, distinct mottles of dark yellowish brown (10YR 4/4); weak, medium, angular blocky structure; very firm when moist; calcareous.

The A horizon ranges from 10 to 12 inches in thickness, from black to very dark grayish brown in color, and from granular to subangular blocky in structure. In places the surface layer is muck 3 to 12 inches thick. The depth to calcareous material ranges from 40 to 60 inches.

Physical and chemical data for four profiles of the Pewamo soils have been published in Soil Survey Investigations Report No. 18 (8).

Pewamo mucky silty clay loam (0 to 2 percent slopes) (Pc).—This soil is mainly in the northern part of the county. The surface layer is 3 to 12 inches thick.

Wetness is the major limitation. Drained areas are well suited to corn, soybeans, small grain, and hay. Undrained areas are suited to bluegrass pasture. These crops respond well to fertilizer. (Capability unit IIw–1; wooodland group 4)

Pewamo silty clay loam (0 to 2 percent slopes) (Pe).—Included with this soil in mapping were small areas of silt loam or silty clay and small areas that have slopes of more than 2 percent.

Wetness is the major limitation. Corn, soybeans, small grain, and hay are well suited. These crops respond well to fertilizer, especially phosphate. There are spots that are black, neutral or mildly alkaline, and deficient in manganese. (Capability unit IIw–1; woodland group 4)

Plainfield Series

The Plainfield series consists of deep, well-drained, gently sloping and moderately sloping soils. These soils are on terraces and outwash plains, mainly in the valley of the Little River and along the St. Joseph River. The native vegetation was hardwood trees.

Plainfield soils have a 26-inch surface layer of very friable fine sand that is very dark grayish brown in the uppermost 8 inches and yellowish brown in the lower part. The 10-inch subsoil is yellowish-brown, loose fine sand. The uppermost 19 inches of the underlying material is light yellowish-brown, loose fine sand, and the lower part is light brownish-gray, firm, calcareous silty clay loam.

Droughtiness is the major limitation. Permanent pasture and Christmas trees are suitable crops.

Profile of a Plainfield fine sand in a cultivated field in the NW¼SE¼ sec. 26, T. 30 N., R. 11 E.

Ap—0 to 8 inches, fine sand, very dark grayish brown (10YR 3/2) when moist and light brownish gray (10YR 6/2) when dry; weak, medium, granular structure; very friable or loose when moist; medium acid; abrupt, smooth boundary.

A2—8 to 26 inches, yellowish-brown (10YR 5/6) fine sand; weak, coarse, subangular blocky structure; very friable when moist; medium acid; clear, wavy boundary.

B2—26 to 36 inches, yellowish-brown (10YR 5/8) fine sand; very weak, coarse, subangular blocky structure; loose when moist; medium acid or strongly acid; gradual, wavy boundary.

C1—36 to 55 inches, light yellowish-brown (10YR 6/4) fine sand; single grain; loose when moist; medium acid; abrupt, smooth boundary.

IIC2—55 to 72 inches, light brownish-gray (10YR 6/2) heavy silty clay loam (glacial till); massive; firm when moist; calcareous.

The A horizon ranges from 10 to 26 inches in thickness and from very dark grayish brown to light yellowish brown in color.

Plainfield fine sand, moderately fine substratum, 2 to 6 percent slopes (PlB).—Included with this soil in mapping were a few areas of fine sandy loam and small areas that have slopes of less than 2 percent.

Droughtiness is the major limitation, and wind erosion is a hazard. Unirrigated areas are suited to Christmas trees and to grass and legumes grown for hay and pasture. Irrigated areas are suited to vegetables, berries and other small fruits, melons, and other special crops. (Capability unit IVs–1; woodland group 6)

Plainfield fine sand, moderately fine substratum, 6 to 12 percent slopes (PlC).—Included with this soil in mapping were small areas that have slopes of less than 6 percent.

Droughtiness is the major limitation, and wind erosion is a hazard. Christmas trees and grass and legumes grown for hay and pasture are suitable crops. (Capability unit VIs–1; woodland group 6)

Rawson Series

The Rawson series consists of deep, well-drained, nearly level to moderately sloping soils. These soils are on the Lake Maumee Plain and in other upland areas. The native vegetation was hardwood trees.

Rawson soils have a 13-inch surface layer of friable loam that is dark grayish brown in the uppermost 7 inches and brown in the lower part. The uppermost 15 inches of subsoil is yellowish-brown, firm sandy clay loam or silty clay loam, and the lower part is very firm silty clay to clay mottled with yellowish brown and pale brown. The underlying material is yellowish-brown, very firm, calcareous silty clay loam mottled with light yellowish brown.

Erosion is the major hazard, except in the nearly level areas. The commonly grown crops are suitable. Crops respond well to lime and fertilizer.

Profile of a Rawson loam in a cultivated field at a point 50 feet south of a church in the NE¼SW¼ sec. 7, T. 32 N., R. 15 E.

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) loam; moderate, medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

A2—7 to 13 inches, brown (10YR 5/3) to yellowish-brown (10YR 5/4) loam; weak, medium and thick, platy structure breaking to moderate, fine and medium, subangular blocky structure; friable when moist; slightly acid; clear, wavy boundary.

B1t—13 to 21 inches, yellowish-brown (10YR 5/6) light sandy clay loam; weak, medium, subangular blocky structure; slightly firm when moist; thin clay films on few ped faces; strongly acid; gradual, wavy boundary.

B21t—21 to 28 inches, yellowish-brown (10YR 5/8) light silty clay loam; moderate, medium and coarse, subangular blocky structure; thin clay films on few ped faces; firm when moist; strongly acid; gradual, wavy boundary.

IIB22t—28 to 41 inches, dark yellowish-brown (10YR 4/4) silty clay to clay; common, medium, faint mottles of yellowish brown (10YR 5/6) and pale brown (10YR 6/3); moderate, medium, subangular blocky structure; very firm when moist; thin clay films on many ped faces; medium acid; gradual, wavy boundary.

C—41 to 50 inches, yellowish-brown (10YR 5/4) fine silty clay loam; common, medium, distinct mottles of light yellowish brown (10YR 6/4); massive; very firm when moist; calcareous.

The A horizon ranges from fine sandy loam to loam in texture, and the B1t and B21t horizons, from loam to silty clay loam.

Rawson fine sandy loam, 2 to 6 percent slopes (RaB).—Included with this soil in mapping were a few small areas that have slopes of less than 2 percent and a few small areas that are moderately eroded or severely eroded.

Erosion is the major hazard. Corn, soybeans, small grain, and hay are well suited. These crops respond well to lime and fertilizer. (Capability unit IIe–1; woodland group 1)

Rawson loam, 0 to 2 percent slopes (RlA).—Included with this soil in mapping were a few small areas of silt loam.

This Rawson soil is well suited to meadow crops and to corn, soybeans, and small grain. These crops respond well to lime and fertilizer. (Capability unit I–1; woodland group 1)

Rawson loam, 2 to 6 percent slopes, moderately eroded (RlB2).—The remaining surface layer of this soil is only 3 to 8 inches thick. Included with this soil in mapping were a few small areas of a slightly eroded soil and a few small areas of a yellowish-brown, severely eroded soil.

Erosion is the major hazard. Corn, soybeans, small grain, and hay are well suited. These crops respond well to lime and fertilizer. (Capability unit IIe–1; woodland group 1)

Rawson loam, 6 to 12 percent slopes, moderately eroded (RlC2).—The remaining surface layer of this soil is only 3 to 8 inches thick. Included with this soil in mapping were a few small areas of a yellowish-brown, severely eroded soil and a few small areas of a soil that is mottled at depths between 14 and 20 inches.

Erosion is the major hazard. Corn, soybeans, small grain, hay, and pasture are suitable crops. These crops respond well to lime and fertilizer. (Capability unit IIIe–1; woodland group 1)

Rensselaer Series

The Rensselaer series consists of deep, very poorly drained, nearly level soils. These soils are on flats and in depressions on stream terraces in the valley of the Little River and along the northern edge of the Lake Maumee Plain. The native vegetation consisted of hardwood trees and marsh grass.

Rensselaer soils have a 14-inch surface layer of very dark brown, friable silty clay loam that is mottled with strong brown in the lowermost 7 inches. The uppermost 17 inches of the 37-inch subsoil is firm sandy clay loam mottled with strong brown; the middle 11 inches is strong-brown or reddish-yellow, firm sandy clay loam mottled with light brownish gray; and the lowermost 9 inches is gray, friable sandy loam mottled with yellowish brown. The underlying material is gray, very friable, calcareous loamy fine sand mottled with yellowish brown.

Wetness is the major limitation. Drained areas are well suited to the commonly grown crops. Crops respond well to fertilizer.

Profile of Rensselaer silty clay loam in a cultivated field in the NW¼NE¼ sec. 10, T. 30 N., R. 13 E.

Ap—0 to 7 inches, very dark brown (10YR 2/2) light silty clay loam; weak, medium, granular structure; friable when moist; neutral; abrupt, smooth boundary.

A1—7 to 14 inches, very dark brown (10YR 2/2) or very dark grayish-brown (10YR 3/2) light silty clay loam; few, fine, faint mottles of strong brown (7.5YR 5/6); weak, medium, granular structure; friable or firm when moist; neutral; gradual, wavy boundary.

IIB21g—14 to 25 inches, gray (10YR 5/1) sandy loam to sandy clay loam; common, fine, distinct mottles of strong brown (7.5YR 5/6); weak to moderate, medium, subangular blocky structure; friable or firm when moist; neutral; clear, wavy boundary.

IIB22g—25 to 31 inches, gray (10YR 5/1) light sandy clay loam; common, medium, prominent mottles of strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; thin clay films on some ped faces; firm when moist; neutral; clear, wavy boundary.

IIB23g—31 to 42 inches, strong-brown (7.5YR 5/6) to reddish-yellow (7.5YR 6/8) sandy clay loam; few ¼- to ½-inch seams of silty clay loam; common, medium, distinct mottles of light brownish gray (10YR 6/2); weak, fine and medium, subangular blocky structure; firm when moist; slightly acid or neutral; gradual, wavy boundary.

IIB3g—42 to 51 inches, gray (10YR 6/1) sandy loam; few, fine, faint mottles of yellowish brown (10YR 5/6); weak, medium, subangular blocky structure; friable when moist; neutral; clear, wavy boundary.

IIC—51 to 72 inches, gray (10YR 6/1) loamy fine sand; many, coarse, distinct mottles of yellowish brown (10YR 5/6); massive; very friable; calcareous; few narrow seams of silty or clayey material; a gravelly layer between depths of 70 and 72 inches.

The A horizon ranges from loam to silty clay loam in texture. In places it is mucky, is only 3 to 12 inches thick, and is dark brown or black. The B2 horizon ranges from light sandy clay loam to silty clay loam in texture. The depth to calcareous material ranges from 40 to 60 inches.

Rensselaer loam (0 to 2 percent slopes) (Rm).—Included with this soil in mapping were a few small areas of silt loam or silty clay loam.

Wetness is the major limitation. Adequately drained areas are suited to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. (Capability unit IIw–1; woodland group 4)

Rensselaer mucky silty clay loam (0 to 2 percent slopes) (Rn).—This soil is in depressions in the valley of the Little River. Its surface layer is only 3 to 12 inches thick.

Wetness is the major limitation. Drained areas are suited to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. Establishing a drainage system is difficult in many places because of the location of the soil in depressions. (Capability unit IIw–1; woodland group 4)

Rensselaer silt loam (0 to 2 percent slopes) (Ro).—Included with this soil in mapping were a few small areas of loam or silty clay loam.

Wetness is the major limitation. Drained areas are well suited to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. (Capability unit IIw–1; woodland group 4)

Rensselaer silty clay loam (0 to 2 percent slopes) (Rs).—Included with this soil in mapping were a few areas, around small beds of muck, that have slopes of 2 to 6 percent and also a few small areas of a limy soil.

Wetness is the major limitation. Adequately drained areas are well suited to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. (Capability unit IIw–1; woodland group 4)

St. Clair Series

The St. Clair series consists of deep, well drained or moderately well drained, gently sloping and moderately sloping soils. These soils are in the southeastern part of the county and on the Lake Maumee Plain. The native vegetation was hardwood trees.

St. Clair soils have a 5-inch surface layer of dark grayish-brown, friable silt loam. The uppermost 2 inches of the 19-inch subsoil is firm silty clay loam, and the rest is mostly brown, very firm silty clay and clay mottled with yellowish brown in the lowermost 10 inches. The underlying material is dark grayish-brown, very firm, calcareous silty clay mottled with light gray.

Erosion is the major hazard. The commonly grown crops are suitable. These crops respond well to lime and fertilizer.

Profile of a St. Clair silt loam in a cultivated field at a point south of a drainage ditch in the NW¼SW¼ sec. 21, T. 31 N., R. 15 E.

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable when moist; neutral; abrupt, smooth boundary.

B1—5 to 7 inches, brown (10YR 5/3) light silty clay loam; moderate, fine, subangular blocky structure; firm when moist; medium acid; clear, wavy boundary.

B21t—7 to 14 inches, brown (10YR 5/3) silty clay; weak, medium, prismatic structure breaking to strong, medium, angular blocky structure; very firm when moist; thin clay films on many ped faces; very strongly acid; clear, wavy boundary.

B22t—14 to 24 inches, brown (10YR 5/3) clay; few, fine, faint mottles of yellowish brown (10YR 5/8) in the upper part and common, medium, distinct mottles of yellowish brown in the lower part; weak, medium, prismatic structure; extremely firm when moist; thin to thick clay films on many ped faces; strongly acid; clear, wavy boundary.

C—24 to 40 inches, dark grayish-brown (10YR 4/2) heavy silty clay loam to silty clay; common, medium, prominent mottles of light gray (10YR 7/2); weak, medium, angular blocky structure; very firm when moist; calcareous.

The A horizon ranges from 5 to 10 inches in thickness and from silt loam to silty clay loam in texture. Soil material from the B1 horizon is mixed with that of the A horizon in many cultivated areas. In some places there is no B1 horizon. The depth to calcareous material ranges from 18 to 28 inches.

St. Clair silt loam, 2 to 6 percent slopes (SaB).—Erosion is the major hazard if this soil is farmed. Corn, soybeans, small grain, and hay are suitable crops. These crops respond well to applications of lime and fertilizer and to other good management practices. (Capability unit IIIe-11; woodland group 8)

St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded (ScB2).—Erosion has removed 3 to 4 inches of the surface layer of this soil, and what remains of the original surface layer has been mixed with the upper part of the subsoil. Included with this soil in mapping were a few small areas of a severely eroded soil.

Erosion is the major hazard. Corn, soybeans, small grain, and hay are suitable crops. These crops respond well to applications of lime and fertilizer and to other good management practices. (Capability unit IIIe-11; woodland group 8)

St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded (ScC2).—Erosion has removed 3 to 4 inches of the original surface layer of this soil. The depth to calcareous material is 18 to 22 inches.

Erosion and excessive runoff are major hazards. Corn, soybeans, small grain, and hay are suitable crops. These crops respond well to applications of lime and fertilizer and other good management practices. (Capability unit IVe-11; woodland group 8)

Shoals Series

The Shoals series consists of deep, somewhat poorly drained, nearly level soils. These soils are on flood plains throughout the county. The native vegetation was hardwood trees.

Shoals soils have a 14-inch surface layer of dark-gray silty clay loam that is friable in the uppermost 8 inches and firm in the lower part. The 8-inch subsoil is gray, firm silty clay loam. The underlying material is brown, firm silty clay loam mottled with gray.

Wetness is a limitation, and flooding is a hazard. Drained areas are well suited to meadow crops and to row crops. Crops respond well to fertilizer.

Profile of Shoals silty clay loam in a cultivated field in the NW¼SE¼ sec. 29, T. 29 N., R. 13 E.

Ap—0 to 8 inches, dark-gray (10YR 4/1) silty clay loam; weak, moderate, granular structure; friable when moist; neutral; abrupt, smooth boundary.

A1—8 to 14 inches, dark-gray (10YR 4/1) silty clay loam; weak or moderate, coarse, subangular blocky structure; firm when moist; neutral; clear, wavy boundary.

B2—14 to 22 inches, gray (10YR 5/1) silty clay loam; weak, medium, subangular blocky structure; firm when moist; neutral; gradual, wavy boundary.

C—22 to 36 inches, brown (10YR 5/3) silty clay loam; common, medium, distinct mottles of gray (10YR 5/1); weak, fine, subangular blocky structure; firm when moist; neutral.

The Ap horizon ranges from dark grayish brown to gray in color.

Shoals silty clay loam (0 to 2 percent slopes) (Sh).—Included with this soil in mapping were a few small areas of a calcareous soil, a few small areas of a very dark grayish-brown soil, and a few small areas that have slopes of 2 to 6 percent.

Wetness is a limitation, and flooding is a hazard. Adequately drained areas are well suited to meadow crops and to corn and soybeans, but not to small grain, which is often damaged severely by flooding. The suitable crops respond well to fertilizer. (Capability unit IIw-7; woodland group 5)

Tawas Series

The Tawas series consists of deep, very poorly drained, nearly level, mucky soils. These soils are in depressions on uplands and along some major streams. The native vegetation consisted of water-tolerant trees, sedges, and marsh grass.

Tawas soils have a 7-inch surface layer of black, very friable muck over an 18-inch layer of friable or very friable muck that is black in the uppermost 12 inches and dark olive gray mottled with reddish brown and light brownish gray in the lowermost 6 inches. The underlying material is grayish-brown and light-gray, loose, calcareous sand.

Wetness is the major limitation. Drained areas are well suited to the common crops and to some special crops. These crops respond well to fertilizer.

Profile of Tawas muck in a cultivated field in the SE¼NE¼NE¼ sec. 18, T. 32 N., R. 12 E.

1—0 to 7 inches, black (N 2/0) muck; weak, fine, granular structure; very friable; slightly acid; abrupt, smooth boundary.

2—7 to 12 inches, black (N 2/0) muck; weak, fine and medium, granular structure; very friable when moist; slightly acid; gradual, wavy boundary.

3—12 to 19 inches, black (10YR 2/1) muck; numerous fragments of partly decomposed wood; weak, medium, subangular blocky structure; friable when moist; slightly acid; gradual, wavy boundary.

4—19 to 25 inches, dark olive-gray (5Y 3/2) muck and some mineral matter; common, distinct mottles of reddish brown (5YR 4/4) and light brownish gray (2.5Y

6/2) ; weak, coarse, subangular blocky structure; friable when moist; slightly acid; abrupt, smooth boundary.

IIC—25 to 40 inches, grayish-brown (2.5Y 5/2) and light-gray (2.5Y 7/2) sand; single grain; loose when moist; calcareous.

In places there is a 2- to 4-inch layer of clayey or silty soil that contains a large amount of organic matter instead of the layer of muck and mineral matter (sand). The underlying material ranges from sand to loamy fine sand in texture, and in places it contains some fine gravel.

Tawas muck (0 to 2 percent slopes) (Ta).—Wetness is the major limitation of this soil. Drained areas are suited to corn, soybeans, sweet corn, mint, potatoes, onions, and other vegetables. These crops respond well to fertilizer. (Capability unit IVw–3; woodland group 9)

Wallkill Series

The Wallkill series consists of deep, very poorly drained, nearly level soils. These soils are in the northern part of the county and in the valley of the Little River. The native vegetation consisted of water-tolerant trees, sedges, and marsh grass.

Wallkill soils have a 9-inch surface layer of dark grayish-brown silt loam underlain by about 21 inches of firm silty clay loam that is dark grayish brown in the uppermost 10 inches, very dark grayish brown in the middle 8 inches, and very dark gray in the lowermost 3 inches. The underlying material is black, friable muck.

Wetness is the major limitation. Drained areas are suited to most common crops. These crops respond well to fertilizer.

Profile of Wallkill silt loam in a cultivated field in the NE¼NE¼ sec. 6, T. 32 N., R. 15 E.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) heavy silt loam; weak, fine and medium, subangular blocky structure; friable or slightly firm when moist; neutral; abrupt, smooth boundary.

C1—9 to 19 inches, dark grayish-brown (10YR 4/2) light silty clay loam; weak, medium and coarse, subangular blocky structure; slightly firm when moist; neutral; clear, wavy boundary.

C2—19 to 27 inches, very dark grayish-brown (2.5Y 3/2) or dark grayish-brown (2.5Y 4/2) silty clay loam; weak, coarse, prismatic structure breaking to moderate, coarse, angular blocky structure; firm when moist; neutral; clear, wavy boundary.

C3—27 to 30 inches, very dark gray (10YR 3/1) or black (10YR 2/1) silty clay loam; moderate, medium and coarse, angular blocky structure; very firm when moist; neutral; abrupt, smooth boundary.

IIC4—30 to 50 inches, black (N 2/0) muck; massive; friable when moist; medium acid.

The A horizon ranges from silt loam to silty clay loam in texture.

Wallkill silt loam (0 to 2 percent slopes) (Wa).—Wetness is the major limitation of this soil. Drained areas are suited to corn, soybeans, oats, and hay. These crops respond well to fertilizer. (Capability unit IIw–7; woodland group 9)

Wallkill silty clay loam (0 to 2 percent slopes) (Wc).—Wetness is the major limitation of this soil. Drained areas are suited to corn, soybeans, and hay. These crops respond well to fertilizer. (Capability unit IIw–7; woodland group 9)

Washtenaw Series

The Washtenaw series consists of deep, very poorly drained, nearly level soils. These soils are in upland depressions and on bottom lands.

Washtenaw soils have a 9-inch surface layer of very dark grayish-brown, friable silt loam underlain by about 9 inches of dark grayish-brown silt loam. The uppermost 6 inches of underlying material is very dark grayish-brown, firm silty clay loam, and the lower part is gray, very firm silty clay loam to silty clay mottled with dark brown or brown.

Wetness is the major limitation. Drained areas are suited to crops. Crops respond to fertilizer.

Profile of Washtenaw silt loam in a cultivated field at a point 600 yards south and 625 yards east of a T-shaped road intersection in the NW¼SW¼ sec. 25, T. 32 N., R. 12 E.

Ap—0 to 9 inches, silt loam, very dark grayish brown (10YR 3/2) when moist and light brownish gray (10YR 6/2) to dark grayish brown (10YR 4/2) when dry; moderate, medium, granular structure; friable when moist; neutral; clear, wavy boundary.

C1—9 to 18 inches; dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable when moist; neutral; clear, wavy boundary.

IIAb—18 to 24 inches, very dark grayish-brown (10YR 3/2) silty clay loam; few, fine, faint mottles of brown or dark brown (7.5YR 4/4) ; weak to moderate, medium, subangular blocky structure; firm when moist; neutral; clear, wavy boundary.

IIC2—24 to 42 inches, gray (10YR 5/1 or 6/1) silty clay loam to silty clay; common mottles of dark brown or brown (10YR 4/3) ; weak, coarse, prismatic structure breaking to strong, medium to coarse, angular blocky and subangular blocky structure; very firm when moist; neutral.

The Ap and C1 horizons consist of relatively recently deposited material. The depth to the IIAb horizon ranges from 15 to 30 inches.

Washtenaw silt loam (0 to 2 percent slopes) (Wh).—Included with this soil in mapping were a few small areas of loam or silty clay loam and small areas of a black or very dark brown soil.

Wetness is the major limitation. Drained areas are well suited to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. (Capability unit IIw–1; woodland group 4)

Westland Series

The Westland series consists of deep, very poorly drained, nearly level soils. These soils are in depressions in the valley of the Little River and in outwash areas. The native vegetation consisted of hardwood trees and marsh grass.

Westland soils have an 11-inch surface layer of silty clay loam that is black and friable in the uppermost 7 inches and very dark gray and firm in the lower part. The upper part of the 35-inch subsoil is firm silty clay loam or clay loam mottled with yellowish brown and reddish brown, and the lower part is grayish-brown clay loam mixed with some gravel. The underlying material is grayish-brown, loose, calcareous gravel and sand mottled with yellowish brown.

Wetness is the major limitation. Drained areas are suited to crops. Crops respond well to fertilizer.

Profile of Westland silty clay loam in a cultivated field in the SE¼NW¼SE¼ sec. 30, T. 30 N., R. 12 E.

Ap—0 to 7 inches, black (10YR 2/1) silty clay loam; moderate, medium and coarse, granular structure; friable when moist; neutral; abrupt, smooth boundary.

A1—7 to 11 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, angular blocky structure; firm when moist; neutral; gradual, smooth boundary.

B21g—11 to 19 inches, gray (10YR 5/1) silty clay loam to clay loam; common, medium, distinct mottles of yellowish brown (10YR 5/4) and dark reddish brown (5YR 3/4) (rust stain); weak, coarse, prismatic structure breaking to moderate, medium, angular blocky structure; firm when moist; medium clay films on numerous ped faces; neutral; gradual, smooth boundary.

B22g—19 to 46 inches, grayish-brown (2.5Y 5/2) clay loam mixed with some gravel; common, medium, distinct mottles of dark reddish brown (5YR 3/4) and yellowish brown (10YR 5/6); moderate, medium, angular blocky and subangular blocky structure; firm when moist; medium clay films on many ped faces; neutral; clear, wavy boundary.

IIC—46 to 60 inches, grayish-brown (2.5Y 5/2) stratified gravel and sand; few, fine, distinct mottles of yellowish brown (10YR 5/4); single grain; loose when moist; calcareous.

The A horizon ranges from black to very dark grayish brown in color and from loam to silty clay loam in texture. The underlying material is mostly gravel in some places and mostly sand in others.

Westland loam (0 to 2 percent slopes) (Ws).—Included with this soil in mapping were a few small areas where the depth to gravel and sand is less than 42 inches.

Wetness is the major limitation. Drained areas are suited to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. (Capability unit IIw–1; woodland group 4)

Westland silty clay loam (0 to 2 percent slopes) (Wt).—Included with this soil in mapping were small areas where the depth to gravel and sand is less than 42 inches.

Wetness is the major limitation. Drained areas are suited to corn, soybeans, small grain, and hay. These crops respond well to fertilizer. Because this soil occurs as small areas, it is generally managed in the same way as adjacent soils. (Capability unit IIw-1; woodland group 4)

Whitaker Series

The Whitaker series consists of deep, somewhat poorly drained, nearly level and gently sloping soils. These soils are in low-lying areas near Huntertown and in the valley of the Little River. The native vegetation was hardwood forest.

Whitaker soils have a 13-inch surface layer of friable loam that is dark grayish brown in the uppermost 9 inches and pale brown mottled with yellowish brown and brownish gray in the lower part. The uppermost 10 inches of the subsoil is yellowish-brown, firm clay loam mottled with grayish brown, and the lower part is gray or light-gray, firm silty clay loam or clay loam mottled with yellowish brown. The underlying material is light-gray, loose, stratified calcareous silt and sand.

Wetness is the major limitation. Drained areas are well suited to hay crops, small grain, and row crops. These crops respond well to lime and fertilizer.

Profile of a Whitaker loam, 1½ miles south of Harlan in a cultivated field in the NW¼SE¼NW¼ sec. 2, T. 31 N., R. 14 E.

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) to very dark grayish-brown (10YR 3/2) loam; moderate, fine and medium, granular structure; friable when moist; slightly acid; abrupt, smooth boundary.

A2—9 to 13 inches, pale-brown (10YR 6/3) loam; few, fine and medium, faint mottles of yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2); weak, thick and very thick, platy structure breaking to moderate, fine and medium, subangular blocky structure; friable when moist; slightly acid; clear, smooth boundary.

B1t—13 to 23 inches, yellowish-brown (10YR 5/6 to 5/8) light clay loam; many, medium, distinct mottles of grayish brown (10YR 5/2); moderate, medium and coarse, subangular blocky and angular blocky structure; firm when moist; thin clay films on few ped faces; strongly acid; clear, wavy boundary.

B2t—23 to 32 inches, gray (10YR 6/1) or light-gray (10YR 7/1) silty clay loam; common, fine, distinct mottles of yellowish brown (10YR 5/6) and brown (10YR 5/3); moderate, medium and coarse, angular blocky structure; firm when moist; medium clay films on numerous ped faces; strongly acid; clear, wavy boundary.

B3—32 to 44 inches, gray (10YR 6/1) clay loam; many, coarse, distinct mottles of yellowish brown (10YR 5/6); weak, coarse, angular blocky structure; firm when moist; slightly acid; clear, wavy boundary.

C—44 to 60 inches, light-gray (10YR 7/2) stratified silt, silt loam, medium sand, and fine sand; single grain; loose; calcareous.

The Ap horizon ranges from very dark grayish brown to grayish brown in color and from fine sandy loam to silt loam in texture. The texture of the B horizon ranges from heavy sandy loam to silty clay loam. The reaction in the solum ranges from strongly acid to neutral. The depth to the stratified underlying material is more than 40 inches in most places but is as little as 36 inches in some places. In places the underlying material is largely silt or sand. Thin lenses of clayey material occur in some places.

Whitaker fine sandy loam, 0 to 2 percent slopes (HnA).—This soil has a subsoil of heavy sandy loam or light clay loam. In some places there are a few pebbles scattered through the profile.

Wetness and droughtiness are limitations. Drained areas are suited to corn, soybeans, oats, wheat, and hay. These crops respond well to lime and fertilizer. Where this soil occurs as small areas, it is generally managed in the same way as adjacent soils. (Capability unit IIw–2; woodland group 2)

Whitaker loam, 0 to 2 percent slopes (HoA).—This soil occurs as small areas and is associated with Rensselaer soils and with other Whitaker soils. Included with this soil in mapping were small areas of a soil that is shallow or moderately deep over sand and gravel.

Wetness is the major limitation. Drained areas are suited to corn, soybeans, oats, wheat, and hay. These crops respond well to lime and fertilizer. (Capability unit IIw–2; woodland group 2)

Whitaker loam, 2 to 6 percent slopes (HoB).—This soil occurs as small areas and is associated with Whitaker loam, 0 to 2 percent slopes. Included in mapping were small areas of silt loam.

Wetness is the major limitation. There is some hazard of erosion. Drained areas that are protected from erosion are suited to corn, soybeans, oats, wheat, and hay. These crops respond well to lime and fertilizer. (Capability unit IIw–2; woodland group 2)

Whitaker silt loam, 0 to 2 percent slopes (HpA).—Included with this soil in mapping were small areas of soils that are shallow or moderately deep over sand and gravel.

Wetness is the major limitation. The intake rate is medium, and runoff is slow. Drained areas are suited to corn, soybeans, oats, wheat, and hay. These crops respond well to lime and fertilizer. (Capability unit IIw-2; woodland group 2)

Willette Series

The Willette series consists of deep, very poorly drained, nearly level mucky soils. These soils are in upland depressions and on bottom lands. The native vegetation consisted of hardwood trees, marsh grass, reeds, and sedges.

Willette soils have a 9-inch surface layer of black, very friable muck over about 10 inches of dark reddish-brown, friable muck. The uppermost 4 inches of the more than 41 inches of underlying material is dark-gray, firm silty clay loam to silty clay; the next 7 inches is dark grayish-brown, firm silty clay loam; and the rest is light brownish-gray, calcareous clay loam.

Wetness is the major limitation. Drained areas are suited to most of the common crops and some special crops. Crops respond well to fertilizer.

Profile of Willette muck in a cultivated field in the NE¼SE¼ sec. 30, T. 30 N., R. 12 E.

1—0 to 9 inches, black (N 2/0) muck; weak, medium to coarse, subangular blocky structure; very friable when moist; medium acid; clear, smooth boundary.

2—9 to 19 inches, dark reddish-brown (5YR 2/2) muck; few undecomposed roots and other fibrous material; moderate, coarse, subangular blocky structure; friable when moist; slightly acid; gradual, wavy boundary.

IIC1—19 to 23 inches, dark-gray (10YR 4/1) silty clay loam; high in organic-matter content; few, brown, undecomposed roots; moderate, coarse, subangular blocky structure; firm when moist; medium acid; gradual, wavy boundary.

IIC2—23 to 30 inches, dark grayish-brown (2.5YR 4/2) fine silty clay loam to silty clay; strong, coarse, subangular blocky structure; firm when moist; medium acid or slightly acid; gradual, wavy boundary.

IIIC3—30 to 42 inches, light brownish-gray (10YR 6/2) fine clay loam; calcareous.

The muck material ranges from strongly acid to slightly acid in reaction and from 12 to 42 inches in thickness. In places the calcareous material is just below the muck.

Willette muck (0 to 2 percent slopes) (Wu).—Included with this soil in mapping were small areas of a soil that is underlain by marl at a depth of 12 to 42 inches.

Wetness is the major limitation. Drained areas are suited to corn, soybeans, potatoes, sweet corn, mint, and onions and other vegetables. Small grain is not a suitable crop, because there is so much nitrogen in the soil that lodging and loss of the crop are likely. The suitable crops respond well to fertilizer. (Capability unit IIIw-8; woodland group 9)

Use and Management of the Soils

This section explains the system of capability grouping used by the Soil Conservation Service and discusses the management of the soils in Allen County by capability units. It also describes the management of soils for woodland, wildlife, recreation, and engineering works. A table showing estimated yields under two levels of management is provided.

Capability Groups of Soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on the limitations of the soils, the risk of damage when they are used, and the way they respond to treatment. The classification does not apply to most horticultural crops or to rice and other crops that have special requirements. The soils are classified according to degree and kind of permanent limitation, without consideration of major and generally expensive land-forming that would change the slope, depth, or other characteristics of the soils, and without consideration of possible but unlikely major reclamation projects.

In the capability system, soils are grouped at three levels: the capability class, the subclass, and the unit.

Capability Classes, the broadest grouping, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, defined as follows:

Class I. Soils have few limitations that restrict their use.

Class II. Soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.

Class III. Soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Class IV. Soils have very severe limitations that restrict the choice of plants, require very careful management, or both.

Class V. Soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover. (There are no class V soils in this county.)

Class VI. Soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

Class VII. Soils have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to pasture, range, woodland, or wildlife.

Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes. (There are no class VIII soils in this county.)

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States but not

in Allen County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to be similar in productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about the management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-6 or IIIw-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation, and the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph. The Arabic numeral identifies the capability unit within the subclass.

Management by Capability Units

More than half of Allen County is used for cultivated crops, mainly corn, soybeans, wheat, and oats, and for forage crops, mainly clover, alfalfa, and grass. There is a small acreage of tomatoes, potatoes, sugar beets, and other special crops. The sloping soils are likely to erode when cultivated. Effective measures for control of erosion include contour farming, proper use of crop residue, and cropping systems that include grass-legume mixtures. Some of the soils are too wet to be used for crops unless artificially drained. Most of the wet soils can be drained with tile, but some need to be drained with surface ditches. All cultivated soils should be tested to determine what amounts of lime and fertilizer are needed.

In the following pages each of the capability units in Allen County is described, and suggestions for the use and management of the soils in each unit are given. The units are not numbered consecutively, because not all of the units in the statewide system are represented in this county. The names of the soil series represented are mentioned in the description of each unit, but this does not mean that all the soils in a given series are in the unit. The capability classification of each individual soil is given in the "Guide to Mapping Units." Gravel pits was not placed in a capability unit.

Capability unit I-1

This unit consists of deep, nearly level, well-drained, medium-textured soils of the Martinsville and Rawson series. These soils have moderate infiltration and permeability and a high available moisture capacity. Their natural fertility is moderate.

The soils in this unit are well suited to field corn, soybeans, small grain, and legumes, as well as to sweet corn, tomatoes, and other special crops.

A rotation consisting of 3 years of row crops and 1 year of small grain and an intercrop is suitable.

These soils are productive and easy to manage and can be cropped intensively. The proper use of crop residue maintains the content of organic matter and helps to keep good tilth. The crops respond well to lime and fertilizer. Corn responds to the application of large amounts of nitrogen, phosphorus, and potassium. Irrigation is feasible but not needed.

Capability unit I-2

This unit consists of deep, nearly level, well drained and moderately well drained, moderately coarse textured to moderately fine textured soils of the Eel and Genesee series. These soils are flooded occasionally in winter and spring. They have moderate infiltration and permeability and high available moisture capacity. They are naturally fertile, and they contain liberal amounts of organic matter. The Genesee fine sandy loam is somewhat droughty.

These soils are suited to corn and soybeans and to truck crops. They are less well suited to wheat, alfalfa, and clover because these crops may be slightly damaged by the flooding. Row crops can be grown continuously.

There are no hazards that affect the growth of row crops, but farming operations may be delayed in spring because of temporary excessive wetness. Irrigation is feasible because the soils are close to water. Fertilizer is needed, especially in intensively managed fields. Lime is rarely needed.

Capability unit IIe-1

This unit consists of deep, gently sloping, well-drained, medium-textured soils. These soils are of the Martinsville, Miami, and Rawson series. They have moderate infiltration and permeability and high available moisture capacity. Their natural fertility is moderate. The content of organic matter is generally adequate. The Rawson soil is sandier than the other soils, has lower available moisture capacity, and is lower in natural fertility.

The soils in this unit are well suited to corn, soybeans, small grains, clover, alfalfa, and grass, and to special crops. Alfalfa, bromegrass, and Ladino clover do well in rotation pasture, and a mixture of birdsfoot trefoil and grass makes a good permanent pasture.

A rotation consisting of 2 years of row crops, 1 year of small grain, and 1 year of meadow is suitable if contour cultivation and other common management practices are used. A catch crop, grown with the small grain and plowed under, can be substituted for the year of meadow. Row crops can be grown a greater proportion of the time if management is more intensive.

Erosion control is the main management need. Contour farming, diversion terraces, sod waterways, and proper crop rotation are among the measures that can be used to control erosion. Tilth is good. Lime and fertilizer are needed.

Capability unit IIe-6

This unit consists of deep, gently sloping, moderately well drained, medium-textured soils of the Morley series. These soils have moderate infiltration, slow permeability, and high available moisture capacity. Their natural fertility is moderate. Their content of organic matter is generally moderate or low.

The soils in this unit are commonly used for corn, soybeans, clover, alfalfa, and grass. An alfalfa-Ladino clover-bromegrass mixture, a bluegrass-birdsfoot trefoil mixture, or other grass-legume mixtures do well in permanent and rotation pastures.

A rotation consisting of 1 year of a row crop, 1 year of small grain, and 1 year of meadow is suitable if contour cultivation and other common management practices are used. Row crops can be grown a greater proportion of the time if management is more intensive.

Erosion is a hazard, particularly in intensively cropped fields. Diversion ditches, contour tillage, stripcropping, and sod waterways are among the measures needed for control of erosion. Crop residue and intercrops help to maintain and increase the organic-matter content. Minimum tillage helps to maintain good tilth. Drainage is not ordinarily needed. Wet spots created by springs or by seepage can be drained with random tile lines. The supply of plant nutrients should be kept at a high level.

Capability unit IIe-9

This units consists of gently sloping, well-drained soils of the Belmore and Fox series. These soils are moderately deep and deep to gravel and sand. They have moderately rapid infiltration, moderate permeability, and moderate available moisture capacity. Their natural fertility is moderate.

The soils in this unit are suited to corn, soybeans, small grain, clover, alfalfa, and grass. If water is available for irrigation, they are also suited to truck crops.

A rotation consisting of 2 years of row crops, 1 year of small grain, and 1 year of meadow is suitable if contour cultivation and other common management practices are used. More row crops can be included in the rotation if management is more intensive.

Erosion is a hazard, but because of the short slopes and the moderately rapid infiltration, not a particularly serious one. Contour farming and sod waterways are among the measures needed for control of erosion. Proper management of crop residue is important in maintaining the organic-matter content. Lime and fertilizer are needed.

Capability unit IIw-1

This unit consists of deep, level and depressional, very poorly drained, dark-colored, medium-textured to fine-textured soils. These soils are of the Brookston, Hoytville, Lenawee, Mermill, Pewamo, Rensselaer, Washtenaw, and Westland series. They are waterlogged in periods of wet weather. They have moderate infiltration, slow permeability, and high available water capacity. Their natural fertility is high. The supply of potassium is generally deficient. The phosphorus content is high, but much of it is not available to plants.

The soils in this unit are suited to corn, soybeans, small grain, clover, alfalfa, grass, tomatoes, and sugar beets.

A rotation consisting of 2 years of row crops, 1 year of small grain, and an intercrop of legumes and grass is suitable if common management practices are used.

Wetness is the main limitation. An adequate drainage system is needed if the common crops are to be grown. Random tile lines (fig. 7) can be used to drain the narrow drainageways and potholes. Diversion terraces that intercept runoff from adjacent uplands are beneficial where feasible. Sod outlets or structural outlets for the diversion terraces are needed. Spring tillage should be delayed until the plow layer is dry. Fall plowing (fig. 8) allows more time in spring for the soils to dry before they are worked. Minimum tillage and use of crop residue

Figure 7.—**Random tile lines are used to drain these swales in Pewamo silty clay loam, which is in capability unit IIw-1.**

help to maintain good tilth. A cropping system that includes a meadow crop or an intercrop of legumes and grass helps to maintain good soil structure, which in turn helps to maintain the movement of air and water through the soil. The crops benefit from fertilizer. Lime is seldom needed.

Capability unit IIw-2

This unit consists of deep, nearly level and gently sloping, somewhat poorly drained, medium-textured or moderately coarse textured soils of the Blount, Crosby, Del Rey, Haskins, and Whitaker series. These soils have moderately slow or slow permeability and high available moisture capacity. Their natural fertility is moderate. The gently sloping areas are erodible.

The soils in this unit are suited to corn, soybeans, small grain, alfalfa, clover, grass, tomatoes, and sugar beets.

If common management practices are used, a rotation consisting of 2 years of row crops and 1 year of small grain with an intercrop of legumes and grass is suitable for the nearly level soils and one consisting of 2 years of row crops, 1 year of small grain, and 2 years of meadow

Figure 8.—**Fall-plowed field of Hoytville silty clay, which is in capability unit IIw-1.**

crops for the gently sloping soils. Row crops can be grown a greater proportion of the time if management is more intensive.

Wetness is the main limitation. An adequate drainage system is needed if the common crops are to be grown. Random tile lines can be used to drain the narrow drainageways and potholes. Diversion terraces that intercept runoff from higher areas are beneficial where feasible. Sod drop outlets or structural drop outlets for the terraces are needed. Other practices needed to maintain productivity and good tilth include fertilization, minimum and properly timed tillage, management of residue, and control of weeds. Fertilizer is needed to make up for deficiencies in potassium and phosphorus, and regular applications of lime are needed.

Capability unit IIw-4

This unit consists of Gilford fine sandy loam, a deep, nearly level, very poorly drained soil. This soil has rapid infiltration, moderate permeability, and moderate available moisture capacity. Its natural fertility is moderate. In some low areas it is deficient in manganese, particularly for soybeans.

Corn, soybeans, wheat, oats, legumes, and grass are commonly grown.

A rotation consisting of 3 years of row crops and 1 year of small grain with a catch crop is suitable if common management practices are used. Row crops can be grown continuously if management is intensive.

Wetness is the main limitation. An adequate drainage system is needed. The crops respond well to fertilization and to occasional applications of lime.

Capability unit IIw-7

This unit consists of nearly level, somewhat poorly drained and very poorly drained soils of the Shoals and Wallkill series. These soils are flooded occasionally, and they have a fluctuating water table. They have moderate infiltration and permeability and high available moisture capacity. Their natural fertility is high.

If adequately drained, the soils in this unit are suited to corn, soybeans, oats, and grass. Many undrained areas are used for permanent bluegrass pasture. Crops that have to be carried through the winter are not generally grown, because of flooding late in fall and early in spring.

A suitable cropping system consists of row crops grown continuously, whether common or more intensive management practices are used.

Wetness is the main limitation. Adequate drainage is important if crops are to be grown. Chemicals give the most effective control of weeds. Fertilizer containing a large amount of nitrogen is needed. Lime is seldom needed.

Capability unit IIs-1

This unit consists of nearly level, well-drained, medium-textured soils of the Belmore and Fox series. These soils are moderately deep to gravel and sand. They have moderately rapid infiltration, moderate permeability, and moderate available moisture capacity. Their natural fertility is moderate.

Irrigated areas are well suited to corn, soybeans, small grain, legumes, grass, and truck crops. The field crops can be grown in unirrigated areas.

A rotation consisting of 2 years of row crops, 1 year of small grain, and 1 year of meadow is suitable if common management practices are used. Row crops can be grown continuously if management is more intensive.

Droughtiness is a serious limitation. In very dry years, supplemental water should be provided to prevent heavy crop damage. Irrigation of high-value cash crops is economically feasible. Crop residue should be left on the soil to maintain and increase the content of organic matter.

Capability unit IIIe-1

This unit consists of deep, moderately sloping, well-drained, medium-textured soils of the Martinsville, Miami, and Rawson series. These soils have moderate infiltration, moderate permeability, and high available moisture capacity. Their natural fertility is moderate.

The soils in this unit are suited to corn, soybeans, small grain, alfalfa, clover, and grass.

A rotation consisting of 2 years of row crops, 1 year of small grain, and 3 years of hay is suitable if contouring and other common management practices are used, and one consisting of 2 years of row crops, 1 year of small grain, and 1 year of meadow is suitable if management is intensive.

Erosion is the main hazard. Contouring is the erosion control practice most commonly used on the short slopes (fig. 9). On the few longer and more uniform slopes, stripcropping can be used. Sod waterways are needed to control erosion in drainageways. Crops that leave enough residue to build up the content of organic matter are beneficial. Lime and fertilizer are needed.

Capability unit IIIe-6

This unit consists of deep, gently sloping and moderately sloping, moderately well drained, medium-textured soils of the Morley series. These soils range from uneroded to severely eroded. They have moderate infiltration, slow permeability, and high available moisture capacity. Their natural fertility is moderate. The supplies of potassium, phosphorus, and nitrogen are low.

The soils in this unit are suited to corn, soybeans, small grain, alfalfa, clover, and grass.

***Figure 9.*—At the right, along a major drainageway, are the short slopes of Martinsville loam, 6 to 12 percent slopes, moderately eroded, which is in capability unit IIIe-1.**

A rotation consisting of 1 year of a row crop, 1 year of small grain, and 1 year of meadow is suitable if contour tillage and other common management practices are used. In this system a catch crop, grown with the small grain and plowed under, can be substituted for the year of meadow. Row crops can be grown a greater proportion of the time if management is intensive.

Erosion is the main hazard in cultivated areas. Stripcropping, diversion ditches, sod waterways (fig. 10), and contour tillage are among the measures needed to control erosion. Leaving crop residue on the soil and including a grass-legume mixture in the cropping system help to control erosion. The aspect of slopes should be considered in seriously eroded areas because crops do not grow so well on southern exposures as on other exposures. The management needs of these soils are similar, but their response is variable. The crops respond well to fertilizer and to occasional applications of lime.

Capability unit IIIe-9

This unit consists of Fox loam, 6 to 12 percent slopes, moderately eroded, a well-drained soil. This soil is moderately deep to sand and gravel. It has moderate permeability and moderate available moisture capacity. Its natural fertility is moderate. The supplies of potassium, phosphorus, and nitrogen are deficient.

This soil is well suited to corn, soybeans, wheat, oats, legumes, and grass.

A rotation consisting of 1 year of a row crop, 1 year of small grain, and 1 year of meadow is suitable if contour tillage and other common management practices are used. In this system a catch crop, grown with the small grain and plowed under, can be substituted for the year of meadow. Row crops can be grown a greater proportion of the time if management is intensive.

This soil occurs as small areas, many of which are managed along with less sloping soils that can be used more intensively. As a result, considerable erosion has taken place. Erosion is the main hazard. Contour tillage, minimum tillage, mulch tillage, and a suitable cropping system help to control erosion. The crops respond well to fertilizer.

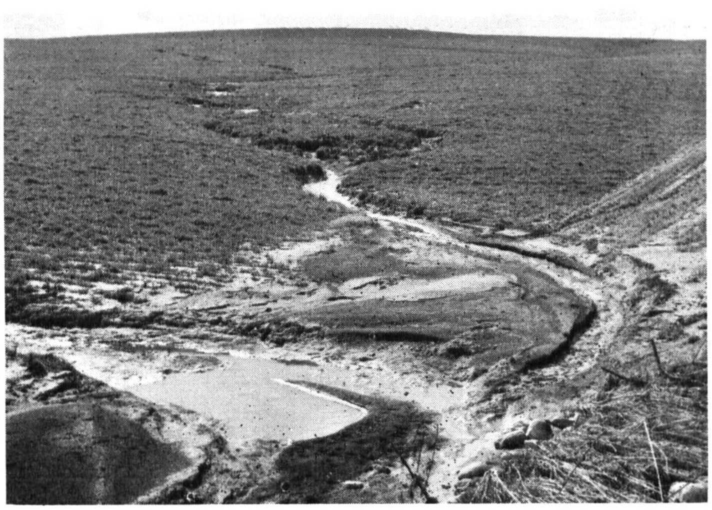

Figure 10.—A wheatfield where a properly shaped sod waterway is needed to control erosion. The soil is a moderately sloping Morley silt loam, which is in capability unit IIIe-6.

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Capability unit IIIe-11

This unit consists of deep, gently sloping, well-drained soils of the St. Clair series. These soils range from uneroded to moderately eroded. They have moderate infiltration, slow permeability, and high available moisture capacity. Their natural fertility is moderately low.

The soils in this unit are suited to corn, soybeans, small grain, clover, alfalfa, and grass. Most of the uneroded soils are wooded or pastured and have not been cropped to any extent.

A rotation consisting of 1 year of a row crop, 1 year of small grain, and 2 years of meadow is suitable if contour cultivation and other common management practices are used. Only 1 year of meadow is needed if management is intensive.

Erosion is the main hazard. Maintaining good tilth and increasing the content of organic matter are problems. Diversion terraces and contour tillage help to control runoff and erosion. Permanent grassed waterways are needed to prevent gullying of natural drainageways. Minimum tillage, a suitable cropping system, and proper use of crop residue help to improve tilth and to increase the content of organic matter. Lime and fertilizer are needed.

Capability unit IIIe-12

This unit consists of Chelsea fine sand, 6 to 12 percent slopes, a deep, excessively drained soil. This soil has rapid infiltration, rapid permeability, and low available moisture capacity. Its natural fertility is low. The supplies of nitrogen, phosphorus, and potassium are generally low. The content of organic matter is low.

This soil is suited to fruits, other special crops, and Christmas trees. Grass or a grass-legume mixture makes good meadow. Irrigated areas are suited to truck crops and to corn, soybeans, and other row crops, but unirrigated areas are better suited to alfalfa and other deep-rooted crops. Some areas have never been cleared, and other areas that have been cleared are now idle.

Erosion is the main hazard. Droughtiness is a serious limitation, but it can be overcome by irrigation. Cropped areas need intensive management. Crop residue, green manure, and barnyard manure help to control erosion, to improve fertility, and to increase the organic-matter content.

Capability unit IIIe-13

This unit consists of deep, gently sloping and moderately sloping, well-drained and somewhat excessively drained, moderately coarse textured soils of the Belmore and Oshtemo series. These soils have moderately rapid infiltration, moderate and moderately rapid permeability, and low available moisture capacity. Their natural fertility is low. The content of organic matter is low.

The soils in this unit are suited to corn, soybeans, small grain, clover, alfalfa, and grass. Wheat and grass-legume mixtures make especially good meadows. Truck crops and special crops grow well where supplemental water is available.

A rotation consisting of 1 year of a row crop, 1 year of small grain, and 1 year of meadow is suitable if contour tillage and other common management practices are used. Row crops can be grown a greater proportion of the time if management is intensive. They can be grown continuously in irrigated areas.

Erosion is the main hazard, and droughtiness is a serious limitation. Contour tillage, plow planting, and a suitable cropping system help to control erosion. Droughtiness can be overcome by irrigation. Crop residue, green manure, and barnyard manure help to improve fertility and to increase the organic-matter content. Applications for fertilizer are necessary.

These soils are easy to work. In places they occur as small areas that are used with larger areas of other soils.

Capability unit IIIw-2

This unit consists of deep, nearly level, very poorly drained, dark-colored, moderately fine textured or fine textured soils of the Bono and Montgomery series. These soils become waterlogged (fig. 11) in periods of wet weather and are slow to dry out in spring. They have very slow infiltration and permeability and high available water capacity. Their natural fertility is moderate. The supplies of manganese and other minor elements may not be adequate in low-lying areas.

The soils in this unit are well suited to corn, soybeans, wheat, oats, legumes, and grass.

A rotation of 2 years of row crops, 1 year of small grain, and 1 year of meadow is suitable if common management practices are used. Row crops can be grown a greater proportion of the time if management is intensive.

Wetness is the major limitation. Maintaining good tilth is a serious problem. A drainage system is needed. Tilth can be maintained or improved by preparing a coarse seedbed, using crop residue, growing green manure crops, growing intercrops of grass and legumes, plowing in fall, and minimum tilling when the soils are not too wet. The crops respond well to fertilization and to occasional applications of lime.

Capability unit IIIw-6

This unit consists of deep, nearly level, somewhat poorly drained, medium-textured or moderately fine textured soils of the Nappanee series. These soils have moderate infiltration, slow permeability, and high available moisture capacity. Their natural fertility is moderate.

The soils in this unit are well suited to corn, soybeans, small grain, clover, alfalfa, and grass.

A rotation of 2 years of row crops, 1 year of small grain, and 1 year of meadow is suitable if common management practices are used. Row crops can be grown a greater proportion of the time if management is intensive.

Wetness is the main limitation. Maintaining good tilth is a problem. An adequate drainage system is needed. Good tilth can be promoted by tilling and permitting grazing only after the plow layer is dry. It is necessary to keep tillage to a minimum. Using crop residue and green manure and including grass and deep-rooted legumes in the cropping system improve tilth. Lime and fertilizer are needed.

Capability unit IIIw-8

This unit consists of moderately deep to deep, nearly level, very poorly drained muck soils of the Carlisle, Linwood, and Willette series. These soils have moderately rapid infiltration and permeability and very high available moisture capacity. They are moderate in natural fertility. The supplies of phosphorus, potassium, and in some areas, some of the minor elements are low. Nitrogen is abundant, but it is not readily available to plants early in the growing season, because the soils are cold at that time. The reaction is nearly neutral in most places, but it is strongly acid in some.

***Figure 11.*—Waterlogged Montgomery silty clay and Bono silty clay, which are in capability unit IIIw-2. Drainage through surface inlets would reduce waterlogging.**

If adequately drained, these soils are suited to corn, soybeans, truck crops, and mint, but not to wheat or oats. They are well suited to pasture crops if they have not been drained enough to be suitable for row crops. Blueberries can be grown where the soils are strongly acid.

Wetness is the main limitation. Early frost and, in dry seasons, wind erosion and fire are hazards. Because the degree of wetness and, consequently, the response to similar management vary from field to field, the specific practices needed must be determined for each field. An adequate drainage system is necessary. In designing a drainage system for these organic soils, the hazard of subsidence must be considered. Frost damage can be avoided by selecting crops that have a short growing season. Wind erosion can be controlled by wetting the surface in dry weather, by establishing windbreaks, and by growing cover crops in unprotected areas. In very dry weather the organic soil material becomes dry enough to burn. Fires can be controlled by means of cutoff ditches and by pumping in water to wet the surface or to raise the water table.

The strongly acid areas of these soils need to be limed every year, unless they are being used for blueberries or other acid-tolerant crops. Nitrogen applied at planting time, when the nitrogen in the soils is not readily available, helps to get crops started.

Capability unit IIIs-1

This unit consists of Chelsea fine sand, 2 to 6 percent slopes, a deep, excessively drained soil. This soil has rapid infiltration and permeability and low available moisture capacity. Its natural fertility is low. The content of organic matter is low.

This soil is well suited to certain fruits, truck crops, Christmas trees, and other special crops, but some of these crops should be grown only where supplemental water is available. Irrigated areas can be farmed intensively and are well suited to row crops and truck crops. Unirrigated

areas are better suited to alfalfa and other deep-rooted crops than to corn and soybeans.

Droughtiness is the major limitation. Wind erosion is a hazard. The droughtiness can be overcome by irrigation, which is feasible where an entire field consists of this soil. In many places small scattered areas of this soil are managed with adjacent soils, but in some places this soil either is idle or has never been cleared. Crop residue, green manure, and barnyard manure improve fertility, increase the organic-matter content, and help to control wind erosion. Minimum tillage also helps to control wind erosion.

Capability unit IIIs-2

This unit consists of deep, nearly level, somewhat excessively drained, moderately coarse textured soils of the Oshtemo series. These soils have moderately rapid infiltration and permeability and low available moisture capacity. Their natural fertility is moderately low. The content of organic matter is low.

The soils in this unit are suited to corn, soybeans, small grain, clover, alfalfa, and grass. They are especially well suited to wheat. Truck crops and special crops do well where supplemental water is available.

A rotation consisting of 1 year of a row crop, 1 year of small grain, and 1 year of meadow is suitable for unirrigated areas where common management practices are used. Row crops can be grown a greater proportion of the time if management is intensive.

Droughtiness is the main limitation. It can be overcome by irrigation. Water for irrigation is available in most places. Care is essential in irrigation to prevent excessive leaching of plant nutrients. Crop residue, green manure, and barnyard manure improve fertility and increase the organic-matter content. Split applications of fertilizer help to minimize the loss of plant nutrients.

Capability unit IVe-1

This unit consists of moderately sloping, well-drained soils of the Martinsville and Miami series. These soils are so severely eroded that the present surface layer consists almost entirely of material from the original subsoil. They have slow infiltration, moderate permeability, and high available moisture capacity. Their fertility is low, and the organic-matter content is low.

The soils in this unit are suited to small grain, alfalfa, clover, and grass. They are less well suited to corn and soybeans.

A cropping system that consists of small grain, meadow, and an occasional row crop is suitable.

Erosion is the major hazard. Improving fertility, improving tilth, and increasing the organic-matter content are problems. Contour cultivation and a cropping system that consists mostly of permanent cover crops help to control erosion. Crop residue, green manure, and barnyard manure help to control erosion and also improve fertility, improve tilth, and increase the organic-matter content. Minimum tillage also helps to maintain tilth. Large amounts of fertilizer are necessary.

Capability unit IVe-6

This unit consists of deep, moderately sloping and strongly sloping, moderately well drained, medium-textured and moderately fine textured soils of the Morley series. These soils have been eroded so severely that the present surface layer consists almost entirely of material from the subsoil. They have slow to moderate infiltration, slow permeability, and high available moisture capacity. Their fertility is low. The content of organic matter is low.

The soils in this unit are suited to small grain, alfalfa, clover, and grass.

A cropping system that consists of small grain and meadow crops is suitable. An occasional row crop can be grown if management is intensive. The meadow crop should be kept until it begins to thin out, and then a nurse crop of small grain should be seeded. Permanent pasture provides good protection.

Erosion is the main hazard. Improving fertility, improving tilth, and increasing the organic-matter content are problems. Contour cultivation, diversion terraces, and sod waterways help to control runoff and erosion. Crop residue, green manure, and barnyard manure improve fertility and increase the organic-matter content. Minimum tillage also improves tilth. Lime and large amounts of fertilizer are needed.

Capability unit IVe-11

This unit consists of St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded, a deep, well drained or moderately well drained soil. This soil has moderate infiltration, slow permeability, and high available moisture capacity. Its fertility is moderately low. The content of organic matter is moderately low.

This soil is suited to small grain and meadow crops. An occasional row crop can be grown if management is intensive.

Erosion is the main hazard. Maintaining good tilth, maintaining fertility, and increasing the organic-matter content are problems. Permanent sod in natural drainageways helps to control gully erosion. Contour cultivation and minimum tillage are effective in the control of runoff and erosion. Crop residue, green manure, and barnyard manure improve tilth, improve fertility, and increase the organic-matter content. Lime and fertilizer are needed.

Capability unit IVe-12

This unit consists of Chelsea fine sand, 12 to 18 percent slopes, a deep, excessively drained soil. This soil has rapid infiltration and permeability and low available moisture capacity. Its fertility is low. The supply of phosphorus is deficient, and the supplies of nitrogen and potassium are low. The organic-matter content is low.

This soil is suitable for permanent woodland and for Christmas trees. Grass-legume mixtures are suitable meadow crops.

Wind erosion is the main hazard. Droughtiness is a limitation, and improving fertility and increasing the organic-matter content are problems. Management is difficult because of the short slopes. Many small areas of this soil either are left idle or are managed in the same way as the adjacent soils. Crop residue, green manure, and barnyard manure help to control erosion, and they improve fertility and increase the organic-matter content. Only drought-resistant permanent crops should be grown. Split applications of fertilizer are advisable because plant nutrients leach out readily.

Capability unit IVw-3

This unit consists of Tawas muck, a deep, nearly level, very poorly drained soil. This soil has moderately rapid infiltration and permeability and moderate available moisture capacity. Its natural fertility is moderate. The supplies of phosphorus, potassium, and some of the minor elements are low.

Adequately drained areas of this soil are suited to field corn, soybeans, sweet corn, potatoes, cabbage, onions, and carrots. These crops can be grown continuously. Wheat is not a suitable crop, because it is likely to lodge and is damaged by frost heaving. Undrained areas are well suited to pasture.

Wetness is the main limitation. Early frost and, in dry seasons, wind erosion and fire are hazards. Because the degree of wetness and, consequently, the response to management vary from field to field, the specific practices needed must be determined for each field. An adequate drainage system is necessary. In designing a drainage system for this organic soil, the hazards of subsidence and overdrainage must be considered. The maintenance of tile drains is difficult because sand seeps into the tile and reduces its capacity. Frost damage can be avoided by selecting crops that have a short growing season. Wind erosion can be controlled by wetting the surface in dry weather, by establishing windbreaks, and by growing cover crops in unprotected areas. In very dry weather the organic soil material becomes dry enough to burn. Fires can be controlled by means of cutoff ditches and by pumping in water to wet the surface or to raise the water table.

Capability unit IVs-1

This unit consists of deep, nearly level and gently sloping, well drained and moderately well drained, coarse-textured soils of the Berrien and Plainfield series. These soils have rapid permeability and low available moisture capacity. Their fertility is low. The content of organic matter is low. Runoff is slow, and the hazard of water erosion is slight.

The soils in this unit are suited to grass and legumes grown for hay and pasture and to Christmas trees. Irrigated areas are suited to vegetables, berries and other small fruits, melons, and other special crops.

Droughtiness is the main limitation. Improving fertility, increasing the organic-matter content, and controlling wind erosion are problems. The droughtiness can be overcome by irrigation. Crop residue increases the organic-matter content and improves fertility. Permanent cover crops help to control wind erosion.

Capability unit VIe-1

This unit consists of deep, strongly sloping and steep, moderately eroded or severely eroded, moderately well drained, medium-textured soils of the Morley series. These soils have slow to moderate infiltration, slow permeability, and high available moisture capacity. Their fertility is low. The organic-matter content is low.

The soils are too steep and too erodible to be suitable for cultivation, except what is necessary for the establishment of permanent pasture.

Erosion is the main hazard. A vegetative cover and protection from overgrazing help to control erosion.

Capability unit VIs-1

This unit consists of Plainfield fine sand, moderately fine substratum, 6 to 12 percent slopes, a deep, light-colored, well-drained soil. This soil has rapid permeability and low available moisture capacity. Its fertility is low. The organic-matter content is low.

This soil is suitable for permanent pasture. It is too droughty and too erodible to be suitable for cultivation, but it can be cultivated enough to establish permanent pastures of drought-resistant grass and legumes.

Droughtiness is the main limitation. Controlling wind erosion, improving fertility, and increasing the organic-matter content are problems. Using the soils for permanent pasture increases the organic-matter content and also helps to control wind erosion if the pasture is protected from overgrazing.

Capability unit VIIe-1

This unit consists of Morley soils, 18 to 25 percent slopes, severely eroded, which are deep, moderately well drained, and medium textured and moderately fine textured. These soils have slow infiltration, slow permeability, and high available moisture capacity. Their fertility is low. The organic-matter content is low.

This soil is suited to pasture, but it is too steep and too erodible to be suitable for cultivation. Much of it is wooded or has other permanent cover.

Erosion is the major hazard. A permanent cover of vegetation is needed. Establishing cover in bare spots is difficult (fig. 12). Pastures need to be protected from overgrazing.

Capability unit VIIe-3

This unit consists of Borrow pits and Made land. These land types occupy only a small acreage and have little or no agricultural value. Some areas of Made land are used as sites for homes or commercial buildings. Some areas of Borrow pits could be developed for wildlife habitat or recreation.

Figure 12.—**Bare surface of Morley soils, 18 to 25 percent slopes, severely eroded, which is in capability unit VIIe-1.**

Estimated Yields

Estimated yields of the principal crops grown in Allen County, under two levels of management, are shown in table 2. These estimates are averages for a period of 5 to 10 years. They are based on data supplied by farmers and other agricultural workers in the county. The A columns show yields that can be expected under the management commonly used, and the B columns, yields that can be expected under improved management.

It should be understood that the estimates may not apply directly to a particular farm for any particular year, because management practices differ slightly from farm to farm and the weather varies from year to year. Nevertheless, these estimates appear to be as accurate a guide as can be obtained to show the relative productivity of the soils and how the soils respond to improved management.

The management needed to obtain the yields in the A columns includes (a) using a cropping system that maintains tilth and the content of organic matter, (b) applying erosion control practices only enough to prevent serious deterioration of the soils, (c) applying moderate amounts of lime and fertilizer, (d) leaving the residue from most crops on the soil, (e) plowing and tilling by conventional methods, (f) choosing crop varieties that are generally suited to the soils, (g) controlling weeds moderately well by tilling and spraying, and (h) draining wet soils well enough that crops can be grown, but not well enough but what yields are somewhat restricted.

TABLE 2.—*Estimated average acre yields of specified crops under two levels of management*

[The figures in columns A indicate yields under common management; those in columns B indicate yields under improved management. Absence of a figure indicates that the crop is not commonly grown on the soil, that the crop is not suited to the soil, or that the soil is not arable]

Soil	Corn		Soybeans		Wheat		Oats		Hay			
									Clover-grass mixtures		Alfalfa-grass mixtures	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Belmore fine sandy loam, 2 to 6 percent slopes	58	74	18	26	30	38	55	65	2.4	3.0	3.5	3.8
Belmore loam, 0 to 2 percent slopes	70	82	24	30	30	38	68	76	3.0	3.6	3.6	4.0
Belmore loam, 2 to 6 percent slopes	68	80	22	28	30	38	63	69	3.0	3.6	3.2	3.8
Berrien loamy fine sand, moderately fine substratum, 0 to 2 percent slopes	55	62	18	26	20	30	45	60	2.2	2.8	2.9	3.4
Blount loam, 0 to 2 percent slopes	75	90	22	30	26	34	50	75	3.0	3.4	3.6	3.9
Blount silt loam, 0 to 2 percent slopes	75	90	22	30	26	34	50	75	3.0	3.4	3.6	3.9
Blount silt loam, 2 to 6 percent slopes	75	90	21	29	26	34	50	72	3.0	3.4	3.6	3.9
Blount silt loam, 2 to 6 percent slopes, moderately eroded	74	89	20	28	26	34	50	71	3.0	3.4	3.6	3.9
Bono mucky silty clay	70	85	22	30	25	33	60	80	2.8	3.2	3.2	3.5
Bono silty clay	70	85	22	30	25	33	60	80	2.8	3.2	3.2	3.5
Borrow pits												
Brookston silt loam	75	115	28	40	35	48	65	92	3.2	3.6	4.0	4.5
Brookston silty clay loam	75	100	28	40	35	42	65	90	3.2	3.6	3.6	4.0
Carlisle muck	75	100	30	38								
Chelsea fine sand, 2 to 6 percent slopes	52	75	18	26	25	32			2.9	3.3	3.3	3.8
Chelsea fine sand, 6 to 12 percent slopes	50	68	18	24	25	32			2.8	3.2	3.1	3.5
Chelsea fine sand, 12 to 18 percent slopes					22	28			2.4	3.0	2.8	3.1
Crosby loam, 0 to 2 percent slopes	76	105	24	36	30	40	50	75	3.0	3.4	3.8	4.0
Crosby silt loam, 0 to 2 percent slopes	76	105	24	36	30	40	50	75	3.0	3.4	3.8	4.0
Crosby silt loam, 2 to 6 percent slopes	76	105	24	36	30	40	50	75	3.0	3.4	3.8	4.0
Crosby silt loam, 2 to 6 percent slopes, moderately eroded	73	100	22	34	30	40	50	75	3.0	3.4	3.8	4.0
Del Rey silt loam	72	88	23	30	25	33	48	68	3.1	3.5	3.5	3.8
Eel loam	70	95	26	32	22	34	55	72	2.8	3.4	3.1	3.5
Eel silt loam	70	95	26	32	22	34	55	72	2.8	3.4	3.1	3.5
Fox loam, 0 to 2 percent slopes	65	85	26	32	33	40	60	70	2.0	2.8	3.2	4.0
Fox loam, 2 to 6 percent slopes	65	85	26	32	33	40	60	70	2.0	2.8	3.2	4.0
Fox loam, 6 to 12 percent slopes, moderately eroded	60	70	20	24	33	40	50	60	1.5	2.5	3.0	3.5
Genesee loam	75	108	32	44	30	38	55	80	2.8	3.2	3.4	3.8
Genesee silt loam	75	108	32	44	30	38	55	80	2.8	3.2	3.4	3.8
Genesee silty clay loam	75	108	32	44	30	38	55	80	2.8	3.2	3.4	3.8
Genesee fine sandy loam, sandy variant	65	85	25	30	30	38	46	60	2.8	3.2	3.4	3.8
Gilford fine sandy loam	75	90	26	33	25	33	60	80	2.8	3.2	3.2	3.5
Gravel pits												
Haskins loam, 0 to 2 percent slopes	70	90	25	33	26	32	60	70	1.5	2.2	3.2	3.5
Haskins loam, 2 to 6 percent slopes	70	90	25	33	28	35	60	70	1.6	2.4	3.2	3.5
Hoytville silty clay	70	102	24	34	30	40	60	85	2.8	3.5	3.2	3.8
Lenawee mucky silty clay loam	75	96	24	34	30	42	60	90	3.2	3.6	3.6	4.0

TABLE 2.—*Estimated average acre yields of specified crops under two levels of management*—Continued

Soil	Corn		Soybeans		Wheat		Oats		Hay			
									Clover-grass mixtures		Alfalfa-grass mixtures	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Lenawee silty clay loam	75	96	24	34	30	42	60	90	3. 2	3. 6	3. 6	4. 0
Linwood muck	72	98	30	38	----	----	----	----	----	----	----	----
Made land	----	----	----	----	----	----	----	----	----	----	----	----
Martinsville loam, 0 to 2 percent slopes	75	105	228	35	35	48	65	100	3. 2	3. 5	3. 5	4. 0
Martinsville loam, 2 to 6 percent slopes	72	102	26	33	35	48	65	100	3. 2	3. 5	3. 5	4. 0
Martinsville loam, 2 to 6 percent slopes, moderately eroded	72	100	26	32	35	48	62	90	3. 2	3. 5	3. 5	4. 0
Martinsville loam, 6 to 12 percent slopes, moderately eroded	58	80	20	25	30	38	50	75	3. 0	3. 2	3. 5	4. 0
Martinsville loam, gravelly substratum, 0 to 2 percent slopes	75	95	24	32	32	40	62	80	3. 2	3. 5	3. 5	4. 0
Martinsville loam, gravelly substratum, 2 to 6 percent	62	88	23	30	32	40	60	75	3. 2	3. 5	3. 5	4. 0
Martinsville silt loam, 0 to 2 percent slopes	75	105	28	35	35	48	65	100	3. 2	3. 5	3. 5	4. 0
Martinsville soils, 6 to 12 percent slopes, severely eroded	35	50	15	20	20	28	50	65	3. 0	3. 2	3. 5	3. 8
Mermill complex	75	115	28	40	35	48	65	100	3. 2	3. 6	3. 6	4. 0
Miami loam, 2 to 6 percent slopes, moderately eroded	75	90	25	35	30	40	50	50	3. 1	3. 6	3. 6	4. 0
Miami silt loam, 6 to 12 percent slopes, moderately eroded	65	80	20	30	29	39	43	62	3. 1	3. 6	3. 1	4. 0
Miami soils, 6 to 12 percent slopes, severely eroded	40	63	18	23	22	30	30	60	3. 0	3. 2	3. 4	4. 0
Montgomery silty clay	70	85	22	30	25	33	68	80	2. 8	3. 2	3. 2	3. 5
Montgomery silty clay loam	70	85	22	30	25	33	60	80	2. 8	3. 2	3. 2	3. 5
Morley silt loam, 2 to 6 percent slopes	62	80	22	28	28	35	42	68	2. 4	2. 8	2. 8	3. 3
Morley silt loam, 2 to 6 percent slopes, moderately eroded	60	78	20	26	27	35	42	65	2. 8	3. 0	3. 2	3. 6
Morley silt loam, 6 to 12 percent slopes	55	75	20	25	27	35	42	65	2. 8	3. 2	3. 2	3. 6
Morley silt loam, 6 to 12 percent slopes, moderately eroded	55	75	20	25	27	35	40	64	2. 8	3. 0	3. 2	3. 6
Morley silt loam, 12 to 18 percent slopes, moderately eroded	----	----	----	----	22	30	25	42	1. 3	2. 6	2. 5	3. 0
Morley silt loam, 18 to 25 percent slopes, moderately eroded	----	----	----	----	----	----	----	----	1. 5	2. 6	2. 5	3. 0
Morley soils, 2 to 6 percent slopes, severely eroded	30	50	10	14	18	25	25	32	1. 5	2. 0	3. 0	3. 6
Morley soils, 6 to 12 percent slopes, severely eroded	----	----	----	----	18	25	25	52	1. 5	2. 0	3. 0	3. 6
Morley soils, 12 to 18 percent slopes, severely eroded	----	----	----	----	----	----	----	----	1. 5	2. 0	3. 0	3. 6
Morley soils, 18 to 25 percent slopes, severely eroded	----	----	----	----	----	----	----	----	----	----	----	----
Nappanee silt loam	65	85	21	29	26	34	48	70	2. 8	3. 2	3. 2	3. 8
Nappanee silty clay loam	65	85	21	29	26	34	48	70	2. 8	3. 2	3. 2	3. 8
Oshtemo fine sandy loam, loamy substratum, 0 to 2 percent slopes	70	95	25	35	35	45	45	60	3. 0	3. 2	3. 5	4. 0
Oshtemo fine sandy loam, loamy substratum, 2 to 6 percent slopes	65	90	25	35	35	45	45	60	3. 0	3. 2	3. 5	4. 0
Oshtemo fine sandy loam, loamy substratum, 6 to 12 percent slopes, moderately eroded	55	80	20	25	35	45	75	85	3. 0	3. 2	3. 5	4. 0
Oshtemo sandy loam, 0 to 2 percent slopes	60	80	18	22	33	40	65	80	2. 0	2. 8	3. 2	4. 0
Oshtemo sandy loam, 2 to 6 percent slopes	60	80	18	22	33	40	65	80	2. 0	2. 8	3. 2	4. 0
Pewamo mucky silty clay loam	72	110	26	36	32	42	60	90	2. 8	3. 5	3. 2	3. 8
Pewamo silty clay loam	72	110	26	36	32	42	60	90	2. 8	3. 5	3. 2	3. 8
Plainfield fine sand, moderately fine substratum, 2 to 6 percent slopes	40	60	14	22	20	30	45	65	2. 1	2. 9	2. 9	3. 5
Plainfield fine sand, moderately fine substratum, 6 to 12 percent slopes	30	50	14	22	20	25	45	65	2. 1	2. 9	2. 9	3. 5
Rawson fine sandy loam, 2 to 6 percent slopes	65	90	25	32	25	35	60	80	2. 1	3. 2	3. 3	4. 0
Rawson loam, 0 to 2 percent slopes	69	105	25	35	25	36	60	90	2. 8	3. 5	3. 3	4. 0
Rawson loam, 2 to 6 percent slopes, moderately eroded	60	85	22	30	25	35	55	85	2. 8	3. 5	3. 3	4. 0
Rawson loam, 6 to 12 percent slopes, moderately eroded	58	83	20	28	24	32	52	68	2. 8	3. 5	3. 3	4. 0
Rensselaer loam	75	115	28	40	35	48	65	100	3. 2	3. 6	3. 6	4. 0

TABLE 2.—*Estimated average acre yields of specified crops under two levels of management*—Continued

Soil	Corn		Soybeans		Wheat		Oats		Hay			
									Clover-grass mixtures		Alfalfa-grass mixtures	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*
Rensselaer mucky silty clay loam	75	115	28	40	35	48	65	100	3.2	3.6	3.6	4.0
Rensselaer silt loam	75	115	28	40	35	48	65	100	3.2	3.6	3.6	4.0
Rensselaer silty clay loam	75	115	28	40	35	48	65	100	3.2	3.6	3.6	4.0
St. Clair silt loam, 2 to 6 percent slopes	58	75	20	25	25	35	55	65	2.0	3.0	2.5	3.5
St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded	55	71	18	22	22	33	50	60	2.0	2.8	2.5	3.5
St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded	----	----	----	----	22	33	40	60	2.0	2.8	2.4	3.4
Shoals silty clay loam	60	90	25	35	15	20	60	80	2.9	3.3	3.0	3.4
Tawas muck	70	90	28	35	----	----	----	----	----	----	----	----
Wallkill silt loam	72	112	26	36	32	42	55	85	2.8	3.5	3.5	4.0
Wallkill silty clay loam	72	110	26	36	32	40	65	85	2.8	3.5	3.5	4.0
Washtenaw silt loam	72	110	26	36	32	40	65	85	2.8	3.5	3.5	4.0
Westland loam	70	110	24	32	30	40	62	84	2.8	3.5	3.5	4.0
Westland silty clay loam	70	110	24	32	30	40	60	80	2.8	3.5	3.5	4.0
Whitaker fine sandy loam, 0 to 2 percent slopes	75	100	24	34	28	36	55	75	3.1	3.6	3.8	4.0
Whitaker loam, 0 to 2 percent slopes	76	105	24	36	36	50	65	85	3.0	3.5	3.8	4.0
Whitaker loam, 2 to 6 percent slopes	70	90	22	30	36	50	60	80	3.0	3.5	3.8	4.0
Whitaker silt loam, 0 to 2 percent slopes	75	105	24	36	36	50	65	85	3.0	3.5	3.8	4.0
Willette muck	75	100	30	38	----	----	----	----	----	----	----	----

The management needed to obtain the yields in the B columns consists of (a) using a cropping system that maintains tilth and the content of organic matter, (b) controlling erosion well enough to maintain or improve the soil, (c) maintaining the supply of available plant nutrients at a high level, (d) applying lime and fertilizer according to the results of frequent soil tests, (e) using crop residue to the fullest extent to protect and improve the soils, (f) using minimum tillage, (g) choosing only the most suitable crop varieties, (h) controlling weeds thoroughly by tilling and spraying, and (i) draining wet soils well enough so that yields are not restricted by wetness.

Woodland[2]

Hardwood forests originally covered a large part of Allen County, but by 1959 only 43,600 acres of woodland remained. Much of the present woodland is on sloping soils and adjacent to streams; many small areas are on wet soils in depressions and other undrained areas; and a small acreage is on droughty, sandy soils. The woodland acreage has decreased as industry and housing have expanded.

Among the soil characteristics that most affect the growth of trees are available water capacity and depth of root zone. Other important characteristics are aeration, thickness of surface layer, natural supply of plant nutrients, texture and consistence of soil material, depth to mottling, and depth to water table.

One of the major forest types represented in Allen County is the mixed upland oak type. This type predominates on the drier, well-drained sites. The major species are white oak, bur oak, red oak, black oak, hickory, white ash, sugar maple, and tulip-poplar.

Another major forest type is tulip-poplar, which is predominant on the lower parts of slopes, on the cool aspects (slopes facing north and northeast), and in the coves. Tulip-poplar is the principal species that is managed for cutting and for woodland improvement. Associated species are white ash, red oak, basswood, black cherry, white oak, hickory, beech, black walnut, and sugar maple.

Of minor importance in this county is the pin-oak type. Associated with the pin oak are soft maple, elm, ash, swamp white oak, and bur oak.

Woodland groups

The soils of Allen County have been placed in nine woodland groups, each made up of soils that are about the same in suitability for trees, in management needs, and in potential productivity. Table 3 gives, by groups, information needed in planning woodland management. The woodland classification of each individual soil is given in the "Guide to Mapping Units." Borrow pits, Gravel pits, and Made land were not placed in a woodland group.

The potential productivity of a soil for a specified kind of tree is expressed as site index. The site indexes for upland oaks, tulip-poplar, and pin oak are given for each group of soils on which these trees grow. The site index is the average height of the dominant trees in a stand at age 50. The site indexes for upland oaks given in table 3 are based on data in USDA Technical Bulletin 560 (*5*),[3] and those for tulip-poplar on data assembled by W. T. Doo-

[2] Prepared by JOHN O. HOLWAGER, woodland conservationist, Soil Conservation Service.

[3] Italic numbers in parentheses refer to Literature Cited, p. 73.

little in 1957 and published by the U.S. Forest Service. For pin oak, the growth data for sweetgum in the Forestry Handbook (*6*) were used. These site indexes can be translated into estimates of yield and annual growth by the use of yield data developed by the Soil Conservation Service from data in USDA publications (*5, 10*).

The terms used in table 3 are defined in the following paragraphs.

Seedling mortality indicates the proportion of natural or planted seedlings that can be expected to die. It is influenced by the nature of the soil, the degree of erosion, and the direction of slope. Mortality is slight if not more than 25 percent of the planted seedlings die, or if trees ordinarily regenerate naturally in places where there are enough seeds. It is moderate if 25 to 50 percent of the seedlings die and some replanting is necessary, or if trees do not regenerate naturally in numbers needed for adequate restocking. Mortality is severe if more than 50 percent of the planted seedlings die or if trees do not ordinarily reseed naturally in places where there are enough seeds. If mortality is severe, it is necessary to do considerable replanting of seedlings, to prepare special seedbeds, and to use superior methods of planting to insure a full stand of trees.

Erosion hazard is rated according to the risk of erosion on well-managed woodland that is not protected by special

TABLE 3.—*Woodland groups and factors in woodland management*

[Borrow pits (Bp), Gravel pits (Gp), and Made land (Ma), were not placed in a woodland group]

Woodland group	Potential productivity		Seedling mortality	Erosion hazard	Windthrow hazard	Equipment limitations	Preferred species	
	Forest type	Site index					In existing stands	For planting
Group 1.	Upland oak Tulip-poplar	85–90 90–105	Slight or moderate.	Slight or moderate.	Slight	Slight or moderate.	Red oak, white oak, sugar maple, tulip-poplar, black walnut, white ash, basswood, black cherry.	Red pine, white pine, tulip-poplar, [1] black walnut.[1]
Group 2.	Upland oak Tulip-poplar	80–92 90–100	Slight	Slight	Moderate or severe.	Moderate	Soft maple, white ash, bur oak.	White pine, soft maple, white ash.
Group 3.	Tulip-poplar	95–105	Slight	Slight	Slight	Slight	Tulip-poplar, cottonwood, soft maple, sycamore.	White pine, cottonwood, black locust, black walnut,
Group 4.	Tulip-poplar	90–105	Moderate	Slight	Moderate or severe.	Severe	Soft maple, pin oak, white ash.	([2]).
Group 5.	Pin oak	90–105	Slight	Slight	Moderate	Moderate	Pin oak, soft maple, white ash.	White pine, cottonwood.
Group 6.	Upland oak Tulip-poplar	80–85 75–85	Slight or moderate.	Slight or moderate.	Slight	Slight or moderate.	White oak, black oak, tulip-poplar, red oak, black walnut.	White pine, red pine, jack pine.
Group 7.	Upland oak	65–75	Moderate	Slight or moderate.	Slight	Slight or moderate.	Black oak, scarlet oak, white oak.	White pine, red pine, jack pine.
Group 8.	Upland oak	70–80	Slight	Slight or moderate	Slight	Moderate	Tulip-poplar, white oak, red oak, bur oak.	White pine.
Group 9.	([3])	([3])	([3])	([3])	([3])	([3])	([3])	White pine, Norway spruce, arborvitae.

[1] Suitable for spot planting in woodland openings.
[2] Only species that regenerate naturally should be grown on the soils in this group.
[3] The soils in this group are not suitable for woodland.

practices. It is slight if a small loss of soil is expected. Generally, the hazard is slight if the slope range is 0 to 2 percent and runoff is slow or very slow. The hazard is moderate where there is a moderate loss of soil if runoff is not controlled and the vegetative cover is not adequate for protection. It is severe where there are steep slopes, rapid runoff, slow infiltration, and slow permeability.

Windthrow hazard represents an evaluation of soil characteristics that affect the development of tree roots and the firmness with which the roots anchor the tree in the soil and enable it to resist the force of wind. The hazard is slight if roots hold the tree firmly against a normal wind, or if individual trees are likely to remain standing if released on all sides. The hazard is moderate if the roots develop enough to hold the tree firmly except when the soil is excessively wet and the wind velocity is very high. It is severe if rooting is not deep enough to give adequate stability, and if individual trees are likely to be blown over if they are released on all sides.

Equipment limitation depends upon drainage, topography, texture, and other soil characteristics that can restrict or prohibit the use of ordinary equipment in tending and harvesting woodland crops. The limitation is slight if there are no restrictions on the type of equipment or on the time of year that the equipment can be used. It is moderate if slopes are moderately steep, or if the use of heavy equipment is restricted by wetness in winter and early in spring. The limitation is severe if many types of equipment cannot be used, if the time during which equipment cannot be used is more than 3 months a year, and if the use of equipment severely damages the roots of trees and impairs the structure and stability of the soil. The limitation is severe on moderately steep and steep slopes that are stony and have rock outcrops. It also is severe on bottom lands and low terraces that are wet in winter and early in spring.

The preferred species are those that grow most rapidly and are most readily and profitably marketed.

Shrub suitability groups

Table 4 gives information about some of the shrubs, vines, and other ground cover that can be used to control erosion, to protect soils and farm buildings from wind, and to provide food and cover for wildlife. The shrub suitability classification of each individual soil is given in the "Guide to Mapping Units." Borrow pits, Gravel pits, and Made land were not placed in a shrub suitability group.

Many plantings serve more than one purpose. Those that help to control erosion in the steeper areas may also help to reduce the cost of mowing and other maintenance work. Shelterbelts and windbreaks to the north and west of farm buildings give year-round protection from wind, as well as adding to the attractiveness of the landscape. Highbush cranberry, multiflora rose, and Amur honeysuckle are useful for erosion control, for protection from wind, and for wildlife food and cover, and they also make good hedges.

TABLE 4.—*Shrub and ground cover plantings*

[Dashes indicate that on the soils of the particular group, the plant is not suitable for any of the specified uses. Borrow pits (Bp), Gravel pits (Gp), and Made land (Ma) were not placed in any of the shrub suitability groups]

Plant	Characteristics of plant	Suitable uses, by shrub suitability groups			
		Group 1	Group 2	Group 3	Group 4
Arrowwood	Ultimate height of 10 to 12 feet; slow growing; shade tolerant.	Wildlife borders	Wildlife borders	------	------
Autumn olive	Ultimate height of 8 to 14 feet; shade tolerant.	------	------	Wildlife borders; areas around ponds.	------
Blackberry	Ultimate height of 4 to 6 feet; thorny; fruit producers.	------	Wildlife borders	Wildlife borders	------
Blackhaw	Ultimate height of 15 to 20 feet; slow growing; shade tolerant.	------	------	Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.
Cherry, Manchu	Ultimate height of 3 to 6 feet; shade tolerant; grows only where plant competition is slight.	------	------	Wildlife borders	Wildlife borders.
Coralberry	Ultimate height of 4 to 6 feet; shade tolerant; may spread into unclipped and nontilled areas.	Wildlife borders; gullies and road cuts.	Wildlife borders; gullies and road cuts.	Wildlife borders; gullies and road cuts.	------
Crabapple, Siberian.	Ultimate height of 15 to 20 feet; shade tolerant.	Wildlife borders; areas around ponds.	------	Wildlife borders; areas around ponds.	------
Cranberry, highbush.	Ultimate height of 6 to 12 feet; slow growing; shade tolerant.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.	------
Currant	Ultimate height of 2 to 4 feet.	------	------	Wildlife borders	------

TABLE 4.—*Shrub and ground cover plantings*—Continued

Plant	Characteristics of plant	Suitable uses, by shrub suitability groups			
		Group 1	Group 2	Group 3	Group 4
Dogwood:					
Gray	Ultimate height of 4 to 8 feet; slow growing.	Wildlife borders	Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.	
Red-osier	Ultimate height of 8 to 12 feet; shade tolerant.	Especially well suited to streambanks; good border plant.	Especially well suited to streambanks.	Especially well suited to streambanks.	
Roughleaf	Ultimate height of 8 to 12 feet.			Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.
Silky	Ultimate height of 6 to 12 feet; shade tolerant; especially well suited to soils that are not artificially drained.	Wildlife borders; areas around ponds; streambanks.	Wildlife borders; areas around ponds; streambanks.	Wildlife borders; areas around ponds; streambanks.	
Hazelnut, American.	Ultimate height of 8 to 10 feet.			Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.
Honeysuckle:					
Amur	Ultimate height of 8 to 16 feet; shade tolerant.	Shelterbelts and windbreaks; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	
Tartarian	Ultimate height of 10 to 16 feet; shade tolerant.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	
Indigobush	Ultimate height of 10 to 15 feet; shade tolerant; good for controlling erosion.				Gullies and road cuts.
Nannyberry	Ultimate height of 6 to 12 feet; slow growing; shade tolerant.	Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.	Wildlife borders; areas around ponds.	
Ninebark	Ultimate height of 6 to 10 feet; shade tolerant; gregarious.				Shelterbelts and windbreaks.
Plum, wild	Ultimate height of 10 to 20 feet; very hardy; thorny.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.	Shelterbelts and windbreaks; wildlife borders.
Raspberry	Ultimate height of 4 to 6 feet; thorny.		Wildlife borders; areas around ponds.	Wildlife borders	
Rose:					
Multiflora	Ultimate height of 6 to 10 feet; thorny; may spread into unclipped and nontilled areas.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; gullies and road cuts.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; gullies and road cuts.	
Rugosa	Ultimate height of 4 to 6 feet; thorny.			Gullies and road cuts.	Gullies and road cuts
Russian-olive	Ultimate height of 10 to 20 feet; shade tolerant; thorny; very hardy.				Shelterbelts and windbreaks.
Sumac:					
Smooth	Ultimate height of 10 to 15 feet.				Wildlife borders.

TABLE 4.—*Shrub and ground cover plantings*—Continued

Plant	Characteristics of plant	Suitable uses, by shrub suitability groups			
		Group 1	Group 2	Group 3	Group 4
Sumac:					
Staghorn	Ultimate height of 10 to 15 feet: shade tolerant; sprouts persistently from roots.				Wildlife borders.
Tulipbush	Ultimate height of 10 to 15 feet; shade tolerant; good for erosion control.			Gullies and road cuts.	
Wayfaring-tree	Ultimate height of 6 to 12 feet.	Wildlife borders	Wildlife borders		
Willow, purple-osier.	Ultimate height of 6 to 10 feet; will reproduce from cuttings.	Shelterbelts and windbreaks; wildlife borders; areas around ponds; especially well suited to streambanks.	Shelterbelts and windbreaks; especially well suited to stream banks.		

Wildlife[4]

A well-planned and well-managed system of farming maintains the productivity of the soils and provides food and cover for wildlife. Farming that depletes the soils reduces the supply of food and the amount of cover. The resulting reduction in the population of desirable animals leads to an increase in the number of insects and of rodents and other destructive animals.

On most farms habitats for wildlife can be improved by increasing and diversifying the supply of food and the areas of food and cover (*2*) and by providing travel lanes.

Only a few farms in Allen County have an ideal balance between cover and food for wildlife. Some farms are used almost entirely for row crops. On these farms food for wildlife is abundant but cover is scarce. Other farms are largely in pasture and woodland, which furnish ample cover but little food.

Cropland, pasture, and woodland can all be managed so as to make both food and cover available. On cropland, cover can be provided by fence rows, by windbreaks, by perennial field borders, and by vegetation in the waterways and on the banks of ditches and streams. In addition to these places of cover, odd areas in fields and the areas around ponds and in marshes can be used for both food and cover. In pasture or woodland, borders that produce seed and fruit can be planted and small areas can be planted to grasses and conifers. For shrubs that make good wildlife borders, see table 4, beginning on page 39.

The kinds of wildlife that live in an area are related to the kinds of soils and to other environmental factors. For that reason, the kinds of wildlife in Allen County are discussed according to their relationship to the eight soil associations, which are described in the section "General Soil Map." Food in the form of farm crops is abundant in much of the county, but cover for small animals is lacking in most places.

The population of bobwhite quail is about six birds to a hundred acres in all eight soil associations. Compared with other counties in the State, Allen County has a small number of these birds.

Pheasants are especially plentiful in association 6 near the eastern border of the county, where the average population is at least 25 birds to a hundred acres. The average population in association 4 is two birds to a hundred acres. In the rest of the county, the average is seven.

More than 25 species of migrating waterfowl pass through the county in spring and fall. Mallards and black ducks are the most numerous. Wood ducks commonly nest near water in all the associations and compete with raccoons for hollow trees in which to rear their broods. A few mallards and blue-winged teals nest in idle open fields and meadows near water.

The number of deer is increasing in all eight associations and most noticeably along the St. Joseph River in association 2 and in the Cedar Canyons area in association 4. Good habitat for deer exists also in wooded areas and along streams in association 1.

Rabbits and squirrels are the most abundant small-game animals in all eight associations but are less numerous in associations 5 and 6 than in the other associations. Rabbits prefer farmland or the edges of fields, where they can obtain food and cover. Fox squirrels are plentiful in small woodlots and on wooded streambanks that are adjacent to cultivated areas.

[4] Prepared by JAMES MCCALL, biologist, Soil Conservation Service.

Among the fur-bearing game animals are raccoons, muskrats, minks, skunks, and opossums. Raccoons and opossums are abundant in wooded areas and along streams in associations 1, 2, and 4.

Fish are common in the main rivers and their tributaries. The principal sport fish are bass, bluegill, and channel catfish. Buffalofish, other suckers, and panfish are also caught.

Recreation[5]

Because of the wide variety and seasonal nature of recreational activities, many different areas can be used for these purposes. Allen County has many areas that have either natural ponds or good sites for pond construction (fig. 13). It also contains some areas that cannot be used profitably for crops, pasture, or timber but that can be developed for recreation. Among these are swampy and marshy areas, wooded areas that have short, steep slopes, and bottom lands that have been cut by stream channels. If managed for multiple use, such areas also provide food and cover for wildlife, protection against runoff, and storage for water. Primitive areas are potential nature laboratories that can be used for educational and scientific purposes.

Figure 13.—**Pond constructed in an area of Pewamo silty clay loam.**

Four areas that have potential for recreational development are recognized. The soils in these areas are suitable for recreational uses but not for farming. They are described briefly, and their potential uses are discussed in the following paragraphs.

Area 1 is within the watersheds of Cedar Creek and the St. Joseph River. It includes both wooded bottom lands and rugged, severely eroded, wooded uplands within soil associations 1, 2, and 4. This area has potential as a wildlife sanctuary and, in its primitive state, as a nature laboratory that can be used for educational and scientific purposes. It can also be managed for watershed protection.

Area 2 is in the valleys of the Maumee River and the St. Marys River. It includes wooded bottom lands and steep, wooded streambanks in all soil associations except association 5. This area has potential as a wildlife sanctuary.

Area 3 is within the watershed of the Little River. It includes seriously eroded wooded uplands, rugged wooded terrain around headwaters, and wet areas and sandy ridges in the valleys, in soil associations 4, 5, and 7. It has potential as a wildlife sanctuary and, in its primitive state, as a nature laboratory that can be used for educational and scientific purposes. It can also be managed for watershed protection.

Area 4 is in the northwestern part of the county, in soil associations 3, 4, and 5. It is characterized by potholes, bogs, lakes, and ditches, and by seriously eroded uplands. This area has potential as a wildlife sanctuary and, in its primitive state, as a nature laboratory that can be used for educational and scientific purposes.

Engineering Uses of the Soils

Soils are of interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. The soil properties most important to engineers are permeability to water, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, texture, plasticity, and pH. Topography, depth to water table, and depth to bedrock are also important.

Information in this publication can be used to—

1. Make studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations at the selected locations.
3. Make preliminary estimates of soil properties that are significant in the planning of agricultural drainage systems, farm ponds, and diversion terraces.
4. Locate probable sources of sand and gravel and other construction materials.
5. Correlate performance of engineering structures with soil mapping units to develop information that will be useful in designing and maintaining engineering structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement information obtained from other sources in making maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

With the use of the soil map for identification, the engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for plan-

[5] By JANE H. DUSTIN, community recreational leader.

ning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some terms used in soil science—for example, soil, clay, silt, and sand—differ in meaning from the same terms used in engineering. These terms are defined in the Glossary.

Engineering classification systems

Two systems of classifying soils are in general use among engineers. Most highway engineers classify soil material according to the system used by the American Association of State Highway Officials (AASHO) (*1*). In the AASHO system, soil materials are classified in seven groups, ranging from A–1, which consists of gravelly soils having high bearing capacity, to A–7, which consists of clay soils having low bearing capacity when wet. The relative engineering value of the soils can be indicated by a group index number, which ranges from 0 for the best materials to 20 for the poorest. The group index number, if it has been determined, is shown in parentheses after the soil group symbol in table 5, for example, A–7–5(14). Highly organic soils, such as peat and muck, which should not be used as construction or foundation material, are not included in this classification.

Some engineers prefer to use the Unified classification system (*11*) developed by the Corps of Engineers, U.S. Army, and revised and expanded in cooperation with the Bureau of Reclamation, U.S. Department of the Interior. In this system, soil materials are identified as coarse grained (eight classes), fine grained (six classes), or highly organic (one class). Soils identified as coarse grained are 50 percent or less material that passes the No. 200 sieve, but those identified as fine grained are more than 50 percent material this size. Highly organic soils generally can be identified visually.

Engineering test data

To help evaluate the soils in Allen County for engineering purposes, samples from 16 profiles were tested according to standard procedures. The results are in table 5.

Moisture-density data are obtained by compacting soil material at successively higher moisture content. Assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, the density decreases with increase in moisture content. The highest dry density obtained in the compaction test is termed "maximum dry density." Moisture-density data are important in earthwork because, as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture content.

California bearing ratio (CBR) is the load-supporting capacity of a soil as compared to that of standard crushed limestone. A soil with a CBR of 16 will support 16 percent of the load that would be supported by the standard crushed limestone, per unit area and with the same degree of distortion.

The relative proportions of the different size particles are determined through mechanical analysis made by a combination of sieve and hydrometer methods.

The tests for plastic limit and liquid limit measure the effect of water on the consistence of soil material. As the moisture content of a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic; the moisture content at which this change occurs is the plastic limit. As the moisture content is further increased, the material changes from a plastic to a liquid; the moisture content at which this change occurs is the liquid limit. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Estimated engineering properties

Table 6 shows estimates of soil properties that affect engineering significantly. Some of these estimates are based on test data and others on past experience in engineering construction. The column headings in table 6 are discussed briefly in the following paragraphs.

The amounts passing sieves No. 10, No. 40, and No. 200 have been rounded to the nearest 5 percent. Gravel-size material does not pass the No. 10 sieve. The material that passes through the No. 200 sieve is mainly silt and clay, but the smaller grains of very fine sand also pass through it.

Permeability indicates the rate at which water moves through undisturbed soil material. The estimates are based largely on texture, structure, and consistence of the soils.

Available water capacity refers to the amount of capillary water held in a soil that is wet to field capacity. This amount of water added to air-dry soil will wet the soil material to a depth of 1 inch without further percolation.

Reaction, which indicates the degree of acidity or alkalinity of a soil, is expressed in pH values.

Frost-heave potential refers to the heave caused by the formation of ice lenses in the soils and the subsequent loss of strength as a result of excess moisture during periods of thaw. For frost-heave potential to become a major consideration, there must be a susceptible soil, a source of water during the freezing period, and low temperature for a period long enough for the ground to freeze.

Shrink-swell potential indicates the volume change to be expected with a change in moisture content. These estimates are based primarily on the amount and kind of clay in the soil.

Engineering interpretations

Table 7 lists, for each soil in Allen County, interpretations of its features that affect its suitability for specific engineering uses. The data in this table apply to the representative profile described in the section "Descriptions of the Soils." A soil feature unfavorable for one engineering use may be favorable for another. Following are brief explanations of the column headings in table 7.

Topsoil refers to soil material, normally only the surface layer, used to topdress back slopes, embankments, lawns, and gardens. Among the features upon which the suitability rating is based are organic-matter content, texture, susceptibility to erosion, and depth to water table.

The suitability ratings for sources of sand and gravel apply only to the uppermost 5 to 7 feet of soil material. These materials occur at various depths within soils of the same series, and consequently, a test pit is needed at each site to determine their extent and availability.

The suitability rating for road subgrade is based on the performance of soil material that has been removed from its original location. Ratings are given for both the subsoil and substratum if their characteristics differ.

TABLE 5.—*Engineering*

[Except for the California Bearing Ratio (CBR) test, tests were performed by Purdue University in cooperation with the Indiana State American Association of State

Soil name and location of sample	Parent material	SCS sample number S60 Ind 2–	Depth from surface	Horizon	Moisture-density data [1]		CBR test [2]			
					Maximum dry density	Optimum moisture content	Molded specimen		CBR	Swell
							Dry density	Moisture content		
			In.		*Lb./cu. ft.*	*Pct.*	*Lb./cu. ft.*	*Pct.*		*Pct.*
Hoytville silty clay: NE¼NW¼ sec. 34, T. 31 N., R. 15 E. (modal).	Glacial till of Wisconsin age.	10–1	0–6	Ap	104	21	100. 3	20. 7	9	1. 8
		10–2	12–25	B21g	100	22	103. 2	21. 5	7	1. 3
		10–3	40–48	C	106	20	107. 5	19. 0	7	1. 0
NW¼SW¼ sec. 4, T. 31 N., R. 15 E. (fine textured).	Glacial till of Wisconsin age.	12–1	0–7	Ap	99	23	100. 0	22. 6	7	1. 1
		12–2	22–35	B22g	102	22	102. 6	21. 4	6	. 8
		12–3	44–56	C	106	18	105. 5	17. 4	2	3. 9
NW¼SW¼ sec. 2, T. 30 N., R. 14 E. (coarse textured).	Glacial till of Wisconsin age.	11–1	0–7	Ap	103	20	101. 2	21. 3	6	2. 4
		11–2	15–25	B21g	103	19	103. 8	20. 6	7	1. 2
		11–3	41–52	C	105	20	106. 9	20. 0	6	1. 7
Martinsville loam, gravelly substratum: SE¼SE¼ sec. 30, T. 32 N., R. 11 E. (modal).	Outwash material of Wisconsin age.	5–1	0–8	A1	111	14	112. 9	13. 6	18	. 4
		5–2	16–31	B21	116	14	116. 7	13. 7	5	<. 1
		5–3	46–54	C	120	11	119. 6	10. 1	42	<. 1
SW¼SE¼ sec. 11, T. 30 N., R. 13 E. (fine textured).	Outwash material of Wisconsin age.	6–1	0–8	A1	103	18	102. 4	17. 8	9	. 6
		6–2	21–42	B21	119	13	118. 2	13. 3	3	0
		6–3	68–72	C	124	12	124. 8	9. 1	25	<. 1
NE¼NE¼ sec. 29, T. 30 N., R. 12 E. (coarse textured).	Outwash material of Wisconsin age.	4–1	0–7	A1	117	12	116. 3	12. 8	9	. 1
		4–2	14–29	B21	120	12	121. 5	12. 4	8	0
		4–3	51–64	C	123	12	125. 1	11. 5	11	<. 3
Martinsville silt loam: NW¼NE¼SW¼ sec. 27, T. 32 N., R. 11 E. (modal).	Outwash material or loessal fine sands and silts.	7–1	0–6	A1	91	23	88. 6	23. 5	6	. 3
		7–2	18–38	B21	111	17	111. 5	16. 8	4	. 2
		7–3	58–66	C	121	12	121. 4	11. 7	6	. 3
SE¼NE¼ sec. 3, T. 30 N., R. 13 E. (fine textured).	Lacustrine fine sands and silts of Wisconsin age.	8–1	0–8	Ap	110	15	110. 6	15. 1	8	. 5
		8–2	12–24	B21	110	17	109. 5	16. 0	7	. 3
		8–3	29–46	C	113	17	110. 7	17. 0	3	. 3
SW¼NE¼ sec. 35, T. 30 N., R. 12 E. (coarse textured).	Lacustrine fine sands and silts of Wisconsin age.	9–1	0–8	Ap	110	16	110. 1	15. 7	4	. 8
		9–2	21–40	B21	111	17	111. 0	16. 9	4	. 2
		9–3	40–65	B23	119	13	119. 1	13. 4	3	0
Morley silt loam: NE¼NE¼ sec. 31, T. 30 N., R. 12 E. (modal).	Glacial till of Wisconsin age.	1–1	0–10	A1	106	18	104. 4	18. 3	4	. 07
		1–2	16–25	B2	101	21	102. 1	22. 6	5	<. 8
		1–3	29–46	C1	112	17	112. 2	17. 0	6	. 6
NE¼SW¼ sec. 27, T. 32 N., R. 13 E. (fine textured).	Glacial till of Wisconsin age.	3–1	0–6	A1	93	24	92. 5	23. 8	5	1. 3
		3–2	13–26	B2	104	21	104. 8	20. 9	6	1. 1
		3–3	31–42	C1	108	16	109. 5	17. 5	5	2. 1
NE¼NE¼ sec. 11, T. 32 N., R. 11 E. (coarse textured).	Glacial till of Wisconsin age.	2–1	0–7	Ap	108	14	107. 0	13. 4	14	. 8
		2–2	17–29	B22	105	20	105. 2	20. 8	5	. 7
		2–3	34–46	C	120	14	117. 2	14. 7	3	. 1

See footnotes at end of table.

test data

Highway Department and the U.S. Department of Commerce, Bureau of Public Roads, in accordance with standard procedures of the Highway Officials (AASHO) (*1*)]

Mechanical analysis [3]									Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than—						AASHO	Unified [4]
¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.007 mm.	0.002 mm.				
-------	--------	100	98	87	84	73	56	30	50	19	A-7-5(14)	ML or OL
-------	--------	100	97	88	82	76	60	43	51	24	A-7-6(16)	MH-CH
-------	--------	100	97	86	84	75	66	40	45	27	A-7-6(16)	CL
-------	--------	100	98	88	84	75	60	35	54	28	A-7-6(18)	CH or OH
-------	100	97	94	87	83	75	62	44	59	38	A-7-6(20)	CH
100	99	95	91	81	75	70	56	35	44	25	A-7-6(15)	CL
-------	--------	100	97	90	85	75	62	44	55	36	A-7-6(19)	CH or OH
-------	--------	100	97	86	83	75	64	45	53	33	A-7-6(19)	CH
-------	--------	100	97	87	83	72	60	43	49	29	A-7-6(17)	CL
100	98	96	89	51	45	34	20	8	21	(5)	A-4(3)	ML or OL
100	93	92	65	28	27	24	20	17	27	10	A-2-4(0)	SC
100	92	78	26	5	5	5	5	4	(5)	(5)	A-1-b(0)	SW-SM
-------	--------	100	98	69	56	34	17	10	30	8	A-4(7)	ML-CL
-------	--------	100	90	46	42	30	22	19	25	9	A-4(2)	SC
100	82	50	45	3	3	3	3	3	(5)	(5)	A-1-b(0)	SP
-------	100	98	87	44	41	27	17	10	19	(5)	A-4(2)	SM
100	95	84	64	25	25	20	17	14	21	(5)	A-2-4(0)	SM
100	88	69	31	8	7	5	4	3	(5)	(5)	A-1-b(0)	SW-SM
-------	--------	100	98	80	68	41	22	12	43	6	A-5(9)	ML or OL
-------	--------	100	99	86	72	54	40	30	37	16	A-6(10)	CL
-------	--------	100	92	61	50	31	20	14	19	4	A-4(5)	ML-CL
-------	--------	100	98	73	64	43	24	13	28	7	A-4(8)	ML-CL
-------	--------	100	99	82	75	57	40	27	33	13	A-6(9)	CL
-------	--------	100	97	91	85	70	41	23	29	9	A-4(8)	CL
-------	--------	100	99	67	55	40	27	16	26	8	A-4(6)	CL
-------	--------	100	98	75	64	54	40	28	36	20	A-6(12)	CL
-------	100	94	92	47	38	27	21	16	23	8	A-4(2)	SC
-------	--------	100	97	85	77	55	28	12	32	7	A-4(8)	ML-CL
-------	--------	100	97	77	76	67	57	45	46	19	A-7-6(13)	ML-CL
-------	--------	100	94	81	76	65	52	35	33	13	A-6(9)	CL
-------	100	98	93	78	68	47	24	12	47	9	A-5(9)	ML or OL
100	99	98	95	83	80	74	63	46	55	31	A-7-6(19)	CH
-------	100	98	96	89	85	75	60	41	44	24	A-7-6(14)	CL
-------	--------	100	96	75	72	60	38	18	28	6	A-4(8)	ML-CL
-------	--------	100	98	87	85	78	61	42	40	19	A-6(12)	CL
100	97	93	85	64	58	51	39	24	29	15	A-6(8)	CL

TABLE 5.—*Engineering*

Soil name and location of sample	Parent material	SCS sample number S60 Ind 2–	Depth from surface	Horizon	Moisture-density data[1]		CBR test[2]			
					Maximum dry density	Optimum moisture content	Molded specimen		CBR	Swell
							Dry density	Moisture content		
			In.		*Lb./cu. ft.*	*Pct.*	*Lb./cu. ft.*	*Pct.*		*Pct.*
Pewamo silty clay loam: SW¼SE¼ sec. 24, T. 30 N., R. 14 E. (modal).	Glacial till of Wisconsin age.	13–1	0–7	Ap	103	21	103. 2	20. 6	7	1. 0
		13–2	12–24	B22g	101	20	99. 3	21. 1	7	1. 5
		13–3	36–48	C	106	20	104. 7	20. 4	5	. 8
SW¼SE¼ sec. 24, T. 32 N., R. 12 E. (fine textured).	Glacial till of Wisconsin age.	15–1	0–7	Ap	101	21	102. 8	21. 2	5	1. 0
		15–2	11–24	B22g	106	18	108. 2	18. 3	8	1. 3
		15–3	32–44	C	108	19	109. 5	13. 3	6	1. 5
NW¼NW¼ sec. 21, T. 32 N., R. 15 E. (coarse textured).	Glacial till of Wisconsin age.	14–1	0–7	Ap	97	22	99. 0	22. 5	6	1. 2
		14–2	13–28	B2g	103	20	103. 7	20. 6	5	. 7
		14–3	38–46	C	108	20	108. 0	19. 9	6	. 6
St. Clair silt loam: NW¼SW¼SW¼ sec. 3, T. 29 N., R. 13 E. (coarse textured).	Glacial till of Wisconsin age.	16–1	0–5	Ap	107	17	109. 2	17. 1	5	. 4
		16–2	14–24	B22	104	21	104. 2	21. 6	6	<1. 7
		16–3	24–38	C	108	19	109. 1	18. 8	6	. 9

[1] Based on AASHO Designation: T 99–57, Method C (*1*).
[2] Sample prepared according to AASHO Designation: T 87–49, and compacted according to AASHO Designation: T 99–57, Method B (*1*).
[3] Mechanical analysis according to AASHO Designation: T 88–57 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2

TABLE 6.—*Estimated*

Soil series and symbol	Depth from surface	Classification		
		USDA	Unified	AASHO
	In.			
Belmore: (BeB).	0–9	Fine sandy loam	ML	A–4
	9–48	Gravelly sandy clay loam	CL	A–4 or A–6
	48–60	Sand and gravel	GP	A–1
(BhA, BhB).	0–9	Loam	ML	A–4
	9–48	Gravelly sandy clay loam	SC or CL	A–4 or A–6
	48–64	Sand and gravel	GP	A–1
Berrien (BkA).	0–18	Loamy fine sand	SM	A–2
	18–62	Loamy fine sand	SM	A–2
	62–72	Silty clay loam	CL	A–7
Blount: (BlA).	0–9	Loam	ML	A–4
	9–27	Silty clay or clay	CL or CH	A–6 or A–7
	27–40	Silty clay loam	CL	A–6
(BmA, BmB, BmB2).	0–9	Silt loam	ML	A–4
	9–27	Silty clay or clay	CL or CH	A–6 or A–7
	27–42	Silty clay loam	CL	A–6

See footnotes at end of table.

test data—Continued

Mechanical analysis [3]									Liquid limit	Plasticity index	Classification	
Percentage passing sieve—					Percentage smaller than—						AASHO	Unified [4]
¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.007 mm.	0.002 mm.				
--------	--------	100	97	89	83	70	52	25	44	21	A-7-6(13)	CL
--------	--------	100	98	86	81	71	57	35	48	24	A-7-6(15)	CL
--------	--------	100	94	84	82	74	59	40	41	22	A-7-6(13)	CL
--------	--------	100	96	81	76	65	45	27	42	19	A-7-6(12)	CL
--------	100	98	95	81	75	69	56	43	52	33	A-7-6(18)	CH
100	99	97	93	80	76	67	55	38	42	24	A-7-6(14)	CL
--------	--------	100	96	86	82	73	52	28	47	21	A-7-6(14)	ML-CL
--------	--------	100	96	84	81	77	60	39	48	28	A-7-6(17)	CL
--------	--------	100	96	85	83	75	60	37	42	24	A-7-6(14)	CL
--------	100	97	93	78	70	57	40	23	31	12	A-6(9)	CL
--------	100	98	94	82	80	71	58	42	49	26	A-7-6(16)	CL
--------	100	99	95	84	80	76	56	35	39	20	A-6(12)	CL

millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes of soils.

[4] SCS and BPR have agreed that all soils having plasticity indexes within 2 points of the A-line are to be given a borderline classification. An example of the borderline classifications obtained by this use is MH-CH.

[5] Nonplastic.

properties of the soils

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost-heave potential	Shrink-swell potential
No. 10	No. 40	No. 200					
			In./hr.	*In./in. of soil*	*pH*		
95–100	85–95	60–70	2. 5– 5. 0	0. 10	6. 1–6. 5	High	Low or moderate.
85–95	70–80	50–60	0. 2– 0. 8	0. 17	6. 1–6. 5	High	Moderate.
30–50	10–20	0–10	>10. 0	0. 03–0. 10	(1)	Very low	Low.
95–100	95–100	70–80	0. 08– 2. 5	0. 17	6. 1–6. 5	High	Moderate.
85–95	65–75	45–55	0. 2– 0. 8	0. 17	6. 1–6. 5	High	Moderate.
30–50	10–20	0–10	>10. 0	0. 03–0. 10	(1)	Low	Low.
95–100	85–95	20–30	5. 0–10. 0	0. 07	5. 1–5. 5	High	Low.
85–95	85–95	20–30	5. 0–10. 0	0. 07	5. 6–6. 0	High	Low.
95–100	95–100	80–90	0. 2– 0. 8	0. 19	(1)	Moderate or high	Moderate.
95–100	95–100	80–85	0. 8– 2. 5	0. 18	6. 1–6. 5	High	Low or moderate.
95–100	95–100	85–95	0. 05–0. 2	0. 17	4. 7–5. 8	Moderate or high	Moderate or high.
95–100	90–100	80–90	0. 2– 0. 8	0. 18	(1)	Moderate or high	Moderate.
100	95–100	90–95	0. 8– 2. 5	0. 21	6. 1–6. 5	High	Low or moderate.
95–100	95–100	95–100	0. 05–0. 2	0. 17	4. 7–5. 8	Moderate or high	Moderate or high.
95–100	90–100	80–90	0. 2– 0. 8	0. 18	(1)	Moderate or high	Moderate.

TABLE 6.—*Estimated properties*

Soil series and symbol	Depth from surface	Classification: USDA	Unified	AASHO
Bono:	*In.*			
(Bn).	0–6	Muck	Pt	
	6–18	Clay	OH	A–7
	18–48	Clay	CH	A–7
	48–60	Clay	CH	A–7
(Bo).	0–19	Clay	OH	A–7–5
	19–57	Clay	CH	A–7
	57–92	Clay	CH	A–7
Borrow pits: (Bp).	(2)	(2)	(2)	(2)
Brookston:				
(Br).	0–13	Silt loam	OL or CL	A–4 or A–6
	13–54	Silty clay loam or clay loam	CL or CH	A–6 or A–7
	54–65	Loam or clay loam	CL	A–6
(Bs).	0–13	Silty clay loam	OL or CL	A–6
	13–54	Silty clay loam or clay loam	CL or CH	A–6 or A–7
	54–62	Loam or clay loam	CL	A–6
Carlisle (Ca).	0–42	Muck	Pt	
Chelsea (ChB, ChC, ChD).	0–30	Fine sand	SM	A–2–4
	30–50	Fine sand and scattered very thin seams of loam	SM	A–2–4 or A–4
Crosby:				
(CrA).	0–9	Loam	CL	A–4
	9–31	Clay loam or silty clay loam	CL	A–6
	31–42	Loam or clay loam	CL	A–6
(CsA CsB CsB2).	0–9	Silt loam	ML or CL	A–4 or A–6
	9–31	Clay loam or silty clay loam	CL	A–6
	31–40	Loam or clay loam	CL	A–6
Del Rey (Dr).	0–8	Silt loam	ML or CL	A–4 or A–6
	8–26	Silty clay loam	CL	A–6
	26–42	Silty clay loam	CL	A–6
Eel:				
(Ee).	0–20	Loam	CL	A–6
	20–24	Silty clay loam	CL	A–6
(Es).	0–20	Silt loam	ML or CL	A–4 or A–6
	20–28	Silty clay loam	CL	A–6
Fox (FmA, FmB, FmC2).	0–12	Loam	ML	A–4
	12–36	Gravelly clay loam	CL	A–6
	36–44	Sand and gravel	GP	A–1
Genesee:				
(Ge).	0–10	Loam	ML	A–4
	10–46	Loam	ML	A–4
(Gh).	0–10	Silt loam	ML	A–4
	10–46	Loam	ML	A–4
(Gm).	0–12	Silty clay loam	CL	A–6
	12–38	Silt loam or silty clay loam	ML or CL	A–4 or A–6
(Gn).	0–32	Fine sandy loam	ML	A–4
	32–55	Loam	ML	A–4
Gilford (Go).	0–14	Fine sandy loam	ML	A–4
	14–49	Fine sandy loam, with less than 8 inches of sandy clay loam.	ML	A–4
	49–60	Sand and seams of silt	SM	A–2–4 or A–4

See footnotes at end of table.

of the soils—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost-heave potential	Shrink-swell potential
No. 10	No. 40	No. 200					
			In./hr.	*In./in. of soil*	*pH*		
----------	----------	----------	2.5–5.0	0.25	6.6–7.3	Moderate	High.
100	95–100	95–100	<0.05	0.17	6.1–6.5	Moderate	High.
100	95–100	95–100	<0.05	0.17	5.6–6.0	Moderate	High.
100	95–100	95–100	<0.05	0.17	(1)	Moderate	High.
100	95–100	95–100	0.05–0.2	0.18	6.1–6.5	Moderate	High.
100	95–100	95–100	<0.05	0.17	5.6–6.0	Moderate	High.
100	95–100	95–100	<0.05	0.17	(1)	Moderate	High.
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2).
100	95–100	90–95	0.8–2.5	0.21	6.1–7.3	Moderate or high	Moderate.
95–100	95–100	90–95	0.05–0.2	0.19	6.1–7.3	Moderate or high	High.
95–100	90–95	75–90	0.8–2.5	0.17	(1)	Moderate to very high	Low or moderate.
100	95–100	90–95	0.2–0.8	0.19	6.6–7.3	Moderate	Moderate.
95–100	95–100	90–95	0.05–0.2	0.19	6.1–7.3	Moderate or high	High.
95–100	90–95	75–90	0.8–2.5	0.21	6.1–7.3	Moderate or high	Moderate.
----------	----------	----------	2.5–5.0	0.25	4.5–7.3	Moderate	High.
95–100	75–85	20–30	5.0–10.0	0.04	6.1–6.5	Low	Low.
95–100	75–85	30–40	5.0–10.0	0.10	6.6–7.3	Low	Low.
95–100	95–100	80–85	0.8–2.5	0.18	6.0–6.6	Moderate to very high	Moderate or low.
95–100	95–100	90–95	0.2–0.8	0.19	5.1–6.0	Moderate or high	Moderate.
95–100	90–95	75–85	0.8–2.5	0.17	(1)	Moderate or high	Moderate.
100	95–100	90–95	0.8–2.5	0.21	6.0–6.6	Moderate or high	Low or moderate.
95–100	95–100	90–95	0.2–0.8	0.19	5.1–6.0	Moderate or high	Moderate.
95–100	90–95	75–85	0.8–2.5	0.17	(1)	Moderate or high	Moderate.
100	95–100	85–95	0.8–2.5	0.21	6.1–6.5	Moderate to very high	Low or moderate.
100	95–100	90–95	0.05–0.2	0.18	6.1–6.5	Moderate or high	Moderate or high.
95–100	90–95	80–85	0.05–0.2	0.18	(1)	Moderate or high	Moderate or high.
95–100	95–100	80–85	0.08–2.5	0.19	6.6–7.3	Moderate to very high	Low or moderate.
95–100	95–100	95–100	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
100	95–100	90–95	0.08–2.5	0.21	6.6–7.3	Moderate to very high	Low or moderate.
95–100	95–100	95–100	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
95–100	95–100	60–70	2.5–5.0	0.17	6.1–6.5	Moderate to very high	Low or moderate.
90–100	70–80	55–65	0.2–0.8	0.17	5.1–6.0	High	Moderate.
30–50	10–20	0–5	>10	0.03	(1)	Very low	Low.
95–100	90–95	75–85	0.8–2.5	0.18	6.6–7.3	Moderate to very high	Low or moderate.
100	90–95	75–85	0.8–2.5	0.20	6.6–7.3	Moderate to very high	Low or moderate.
100	95–100	90–95	0.8–2.5	0.21	6.6–7.3	Moderate to very high	Low or moderate.
100	90–95	75–85	0.8–2.5	0.20	6.6–7.3	Moderate to very high	Low or moderate.
100	95–100	85–90	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
95–100	95–100	85–90	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
95–100	95–100	70–80	2.5–5.0	0.10	6.6–7.3	High	Low or moderate.
95–100	85–95	70–80	0.8–2.5	0.16	6.6–7.3	High	Low or moderate.
95–100	95–100	70–80	2.5–5.0	0.12	6.1–6.5	High	Low or moderate.
95–100	95–100	80–85	2.5–5.0	0.15	6.1–6.5	High	Low or moderate.
95–100	45–55	30–40	5.0–10.0	0.07	(1)	Moderate to very high	Low or moderate.

TABLE 6.—*Estimated properties*

Soil series and symbol	Depth from surface	Classification		
		USDA	Unified	AASHO
	In.			
Gravel pits (Gp).	(2)	(2)	(2)	(2)
Haskins (HaA, HaB).	0–12	Loam	CL	A–6
	12–22	Sandy clay loam	CL	A–6
	22–33	Silty clay loam	CL	A–6
Hoytville (Hs).	0–7	Silty clay	OH or CH	A–7
	7–38	Clay or silty clay	CH	A–7
	38–41	Silty clay	CH	A–7
Lenawee:				
(Le).	0–5	Muck	Pt	----------
	5–20	Silty clay loam	CL	A–6
	20–45	Silty clay loam	CL	A–6
	45–60	Silty clay loam	CL	A–6
(Ls).	0–16	Silty clay loam	OL or CL	A–6
	16–45	Silty clay loam	CL	A–6
	45–54	Silty clay loam	CL	A–6
Linwood (Lw).	0–24	Muck	Pt	----------
	24–44	Loam	ML	A–4
Made land (Ma).	(2)	(2)	(2)	(2)
Martinsville:				
(McA, McB, McB2, McC2).	0–13	Loam	ML or CL	A–4 or A–6
	13–35	Sandy clay loam	SC or CL	A–4 or A–6
	35–48	Fine sandy loam	SM or ML	A–4
	48–60	Sands and silts	SM	A–2–4 or A–4
(MeA, MeB)	0–21	Loam	ML or CL	A–4 or A–6
	21–55	Sandy clay loam	SC or CL	A–6
	55–64	Sand and gravel	SP or GP	A–1
(MfA).	0–13	Silt loam	ML or CL	A–4 or A–6
	13–35	Clay loam	SC or CL	A–6
	35–48	Fine sandy loam	SM or ML	A–4
	48–58	Sands and silts	SM	A–2–4 or A–4
(MgC3).	0–30	Sandy clay loam	SC or CL	A–6
	30–43	Fine sandy loam	ML	A–4
	43–55	Sands and silts	SM	A–2–4 or A–4
Mermill (Mh).	0–10	Loam	CL	A–6
	10–40	Clay loam	CL	A–6
	40–44	Sandy clay loam	CL	A–6
	44–60	Silty clay or silty clay loam	CL or CH	A–6 or A–7
Miami:				
(MkB2).	0–8	Loam	CL	A–6
	8–28	Silty clay loam	CL	A–6
	28–42	Loam	ML	A–4
(MlC2).	0–8	Silt loam	ML or CL	A–4 or A–6
	8–28	Silty clay loam	CL	A–6
	28–38	Loam	ML	A–4
(MmC3).	0–20	Silty clay loam	CL	A–6
	20–34	Loam	ML	A–4

See footnotes at end of table.

of the soils—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Frost-heave potential	Shrink-swell potential
No. 10	No. 40	No. 200					
			In./hr.	*In./in. of soil*	*pH*		
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2).
95-100	95-100	75-85	0.8-2.5	0.18	6.1-6.5	High	Low or moderate.
95-100	95-100	90-95	0.8-2.5	0.21	5.1-6.0	High	Low or moderate.
95-100	85-95	70-80	0.05-0.8	0.19	[1] 7.0-8.0	Moderate or high	Moderate.
100	95-100	90-95	0.8-2.5	0.19	6.6-7.3	Moderate	High.
95-100	95-100	95-100	0.05-0.20	0.17	6.6-7.3	Moderate	High.
95-100	95-100	90-95	0.05-0.20	1.17	(1)	Moderate	High.
-----	-----	-----	0.8-2.5	0.25	6.6-7.3	Moderate	High.
100	95-100	85-90	0.2-0.8	0.19	6.6-7.3	Moderate	High.
95-100	95-100	85-90	0.05-0.2	0.19	6.6-7.3	Moderate	High.
95-100	95-100	85-90	0.05-0.2	0.19	(1)	Moderate	High.
100	95-100	85-90	0.2-0.8	0.19	6.6-7.3	Moderate	Moderate.
95-100	95-100	85-90	0.05-0.2	0.19	6.6-7.3	Moderate	High.
95-100	95-100	85-90	0.05-0.2	0.19	(1)	Moderate	High.
-----	-----	-----	2.5-5.0	0.25	6.6-7.3	Moderate	High.
95-100	85-95	75-85	0.8-2.5	0.19	(1)	Moderate to very high	Low or moderate.
(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2).
95-100	95-100	70-80	0.08-2.5	0.18	5.6-7.3	Moderate to very high	Moderate.
95-100	90-95	45-55	0.2-0.8	0.17	5.1-6.0	High	Moderate.
85-95	65-75	45-55	2.5-5.0	0.10	6.1-6.5	High	Moderate.
95-100	45-55	30-40	5.0-10.0	0.07	(1)	Moderate to very high	Low or moderate.
95-100	95-100	70-80	0.8-2.5	0.18	6.1-7.3	Moderate to very high	Low or moderate.
100	90-95	45-55	0.2-0.8	0.17	5.6-6.0	High	Low or moderate.
30-50	10-20	0-10	>10.0	0.03-0.10	(1)	Very low	Low.
100	95-100	90-95	0.08-2.5	0.21	5.6-7.3	Moderate to very high	Low or moderate.
95-100	90-95	45-55	0.2-0.8	0.17	5.1-6.0	High	Moderate.
85-95	65-75	45-55	2.5-5.0	0.10	6.1-6.5	High	Low or moderate.
95-100	45-55	30-40	5.0-10.0	0.07	(1)	Moderate to very high	Low or moderate.
95-100	90-95	45-55	0.2-0.8	0.18	5.1-6.0	High	Moderate.
100	95-100	70-80	0.08-2.5	0.10	6.1-6.5	High	Moderate.
95-100	45-55	30-40	5.0-10.0	0.07	(1)	Moderate to very high	Low or moderate.
100	95-100	70-80	0.8-2.5	0.19	6.6-7.3	Moderate to very high	Moderate.
100	95-100	85-95	0.2-0.8	0.19	6.6-7.3	Moderate or high	High.
95-100	90-95	75-85	0.2-0.8	0.17	6.6-7.3	High	Moderate.
100	95-100	85-95	0.05-0.2	0.19	(1)	Moderate to high	High.
95-100	95-100	70-80	0.8-2.5	0.18	6.0-6.6	Moderate to very high	Low or moderate.
100	95-100	85-95	0.2-0.8	0.19	5.5-6.5	Moderate or high	Moderate.
100	95-100	70-80	0.8-2.5	0.20	(1)	Moderate to very high	Low or moderate.
100	95-100	90-95	0.8-2.5	0.21	6.0-6.6	Moderate to very high	Low or moderate.
100	95-100	85-95	0.2-0.8	0.19	5.5-6.5	Moderate or high	Moderate.
100	95-100	70-80	0.8-2.5	0.20	(1)	Moderate to very high	Low or moderate.
100	95-100	85-95	0.2-0.8	0.19	5.5-6.5	Moderate or high	Moderate.
100	95-100	70-80	0.8-2.5	0.20	(1)	High	Low or moderate.

TABLE 6.—*Estimated properties*

Soil series and symbol	Depth from surface	Classification		
		USDA	Unified	AASHO
Montgomery:	*In.*			
(Mn).	0–10	Silty clay	OH	A–7
	10–64	Silty clay or clay	CH	A–7
	64–72	Silty clay	CH	A–7
(Mo).	0–10	Silty clay loam	OH	A–6
	10–64	Silty clay or clay	CH	A–6
	64–72	Silty clay	CH	A–7
Morley:				
(MrB, MrB2, MrC, MrC2, MrD2, MrE2).	0–6	Silt loam	ML or CL	A–6
	6–24	Silty clay loam or clay	CL or CH	A–6 or A–7
	24–42	Silty clay loam	CL	A–6 or A–7
(MsB3, MsC3, MsD3, MsE3).	0–18	Silty clay loam	CL or CH	A–6 or A–7
	18–30	Silty clay loam or clay	CL or CH	A–6 or A–7
Nappanee:				
(Na).	0–8	Silt loam	ML or CL	A–4 or A–6
	8–33	Clay	CH	A–7
	33–42	Silty clay	CH	A–7
(Np).	0–8	Silty clay loam	CL	A–6 or A–7
	8–33	Clay	CH	A–7
	33–40	Silty clay	CH	A–7
Oshtemo:				
(OfA, OfB, OfC2).	0–14	Fine sandy loam	ML	A–4
	14–21	Loam	ML	A–4
	21–55	Heavy sandy loam	ML	A–4
	55–68	Sands and silts	SM	A–2–4 or A–4
(OsA, OsB).	0–43	Sandy loam	ML	A–4
	43–50	Gravelly sandy clay loam	ML	A–4
	50–65	Sand and gravel	GP	A–1
Pewamo:				
(Pc).	0–4	Muck	Pt	----------
	4–12	Silty clay loam	OL or CL	A–6 or A–7
	12–52	Silty clay	CH	A–7
	52–64	Silty clay loam	CL	A–6 or A–7
(Pe).	0–9	Silty clay loam	OL or CL	A–6
	9–50	Silty clay	CH	A–7
	50–60	Clay loam or silty clay loam	CL	A–6
Plainfield (PlB, PlC).	0–36	Loamy fine sand	SM	A–2–4
	36–55	Fine sand	SM	A–2–4
	55–72	Silty clay loam	CL	A–6 or A–7
Rawson:				
(RaB).	0–13	Fine sandy loam	ML	A–4
	13–28	Sandy clay loam or silty clay loam	CL	A–6
	28–41	Silty clay loam or clay	CL or CH	A–6 or A–7
(RlA, RlB2, RlC2).	0–13	Loam	ML	A–4
	13–28	Sandy clay loam or silty clay loam	CL	A–6
	28–50	Silty clay loam or clay	CL or CH	A–6 or A–7

See footnotes at end of table.

of the soils—Continued

Percentage passing sieve— No. 10	Percentage passing sieve— No. 40	Percentage passing sieve— No. 200	Permeability	Available water capacity	Reaction	Frost-heave potential	Shrink-swell potential
			In./hr.	*In./in. of soil*	*pH*		
100	95–100	95–100	0.05–0.2	0.19	6.1–6.5	Moderate	High.
100	95–100	95–100	< 0.05	0.17	5.6–6.0	Moderate	High.
100	95–100	95–100	< 0.05	0.17	[1]	Moderate	High.
100	95–100	80–90	0.2–0.8	0.19	6.1–6.5	Moderate or high	High.
100	95–100	95–100	< 0.05	0.19	5.6–6.0	Moderate	High.
100	95–100	95–100	< 0.05	0.17	5.6–6.0	Moderate	High.
100	95–100	85–95	0.8–2.5	0.21	5.5–6.1	Moderate to very high	Low or moderate.
100	95–100	80–95	0.05–0.2	0.17	5.6–6.0	Moderate or high	Moderate.
100	95–100	85–95	0.2–0.8	0.18	[1]	Moderate or high	Moderate.
100	95–100	85–95	0.05–0.20	0.17	5.6–6.0	Moderate or high	Moderate.
100	95–100	85–95	0.2–0.8	0.18	[1]	Moderate or high	Moderate.
100	95–100	85–95	0.08–2.5	0.20	5.6–6.0	High	Moderate.
100	95–100	85–95	< 0.05	0.16	5.1–6.0	Moderate	High.
100	95–100	85–95	< 0.05	0.16	[1]	Moderate	High.
100	95–100	85–95	0.2–0.8	0.19	5.6–6.0	Moderate or high	Moderate.
100	95–100	85–95	< 0.05	0.16	5.1–6.0	Moderate	High.
100	95–100	85–95	< 0.05	0.16	[1]	Moderate	High.
95–100	85–95	60–70	2.5–5.0	0.10	5.6–6.0	High	Low or moderate.
95–100	95–100	70–80	0.8–2.5	0.20	5.1–5.5	Moderate to very high	Low or moderate.
95–100	85–95	65–75	2.5–5.0	0.15	[1]	High	Low or moderate.
95–100	45–55	30–40	5.0–10.0	0.15	[1]	Moderate	Low.
95–100	85–95	60–70	2.5–5.0	0.10	5.6–6.0	High	Low or moderate.
85–95	75–85	50–60	0.2–0.8	0.17	5.1–5.5	High	Low or moderate.
30–50	10–20	0–10	> 10.0	0.03–0.10	[1]	Very low	Low
---	---	---	2.5–5.0	0.25	6.6–7.3	Moderate	High.
100	95–100	90–95	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
100	95–100	95–100	0.05–0.20	0.17	6.6–7.3	Moderate	High.
100	95–100	80–90	0.2–0.8	0.19	[1]	Moderate or high	Moderate.
100	95–100	90–95	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
100	95–100	95–100	0.05–0.20	0.17	6.6–7.3	Moderate	High.
100	95–100	80–90	0.2–0.8	0.19	[1]	Moderate or high	Moderate.
95–100	85–95	20–30	5.0–10.0	0.04	5.6–6.0	High	Low.
95–100	85–95	10–15	5.0–10.0	0.07	5.6–6.0	Low	Low.
95–100	95–100	85–95	0.05–0.20	0.19	[1]	Moderate or high	Moderate.
95–100	85–95	60–70	2.5–5.0	0.10	6.1–6.5	High	Low or moderate.
95–100	90–100	75–95	0.2–0.8	0.17–0.19	6.1–6.5	High	Low or moderate.
95–100	95–100	85–95	0.05–0.20	0.19	[1]	Moderate or high	Moderate.
95–100	95–100	70–80	0.2–0.8	0.18	6.6–7.3	Moderate to very high	Low or moderate.
95–100	85–95	75–95	0.2–0.8	0.17–0.19	6.1–6.5	High	Low or moderate.
95–100	95–100	85–95	0.05–0.20	0.19	[1]	Moderate or high	Moderate.

TABLE 6.—*Estimated properties*

Soil series and symbol	Depth from surface	Classification		
		USDA	Unified	AASHO
	In.			
Rensselaer:				
(Rm).	0–15	Loam	CL	A–6
	15–42	Sandy clay loam	CL	A–6
	42–51	Fine sandy loam	ML	A–4
	51–72	Loamy fine sand	SM	A–2–4
(Rn, Rs).	0–15	Silty clay loam	CL	A–6
	15–42	Sandy clay loam	SC or CL	A–4
	42–51	Fine sandy loam	SM or ML	A–4
	51–70	Loamy fine sand	SM	A–2–4
(Ro).	0–15	Silt loam	ML or CL	A–4 or A–6
	15–42	Sandy clay loam	CL	A–6
	42–51	Fine sandy loam	ML	A–4
	51–70	Loamy fine sand	SM	A–2–4
St. Clair:				
(SaB, ScB2).	0–5	Silt loam	ML or CL	A–4 or A–6
	5–24	Silty clay or clay	CH	A–7
	24–40	Silty clay	CH	A–7
(ScC2).	0–5	Silty clay loam	CL	A–6 or A–7
	5–24	Silty clay	CH	A–7
	24–42	Silty clay loam	CL	A–6 or A–7
Shoals (Sh).	0–14	Silty clay loam	OL or CL	A–6 or A–7
	14–36	Silty clay loam	CL	A–6 or A–7
Tawas (Ta).	0–25	Muck	Pt	----------------
	25–40	Sand	SM	A–2–4
Wallkill:				
(Wa).	0–10	Silt loam	OL or ML	A–4
	10–30	Silt loam	ML or CL	A–4 or A–6
	30–50	Muck	Pt	----------------
(Wc).	0–9	Silty clay loam	OL or CL	A–6 or A–7
	9–30	Silty clay loam	CL	A–6 or A–7
	30–45	Muck	Pt	----------------
Washtenaw (Wh).	0–18	Silt loam	OL or ML	A–4
	18–24	Silty clay loam	CL	A–6 or A–7
Westland:				
(Ws).	0–11	Loam	OL or ML	A–4
	11–46	Silty clay loam	CL	A–6 or A–7
	46–60	Sand and gravel	GP or SP	A–1
(Wt).	0–11	Silty clay loam	OL or CL	A–6 or A–7
	11–46	Silty clay loam or clay loam	CL	A–6 or A–7
	46–60	Sand and gravel	GP or SP	A–1
Whitaker:				
(HnA).	0–13	Fine sandy loam	ML	A–4
	13–44	Silty clay loam	CL	A–6 or A–7
	44–60	Fine sand and silt	ML	A–4 or A–2–4
(HoA, HoB).	0–13	Loam	CL	A–6
	13–44	Silty clay loam	CL	A–6 or A–7
	44–62	Fine sand and silt	SM	A–2–4 or A–4
(HpA).	0–13	Silt loam	ML or CL	A–4 or A–6
	13–44	Silty clay loam	CL	A–6 or A–7
	44–56	Fine sand and silt	SM	A–2–4 or A–4
Willette (Wu).	0–19	Muck	Pt	----------------
	19–42	Clay	CH	A–7

[1] Calcareous.

of the soils—Continued

Percentage passing sieve— No. 10	No. 40	No. 200	Permeability	Available water capacity	Reaction	Frost-heave potential	Shrink-swell potential
			In./hr.	*In./in. of soil*	*pH*		
95–100	95–100	70–80	0.8–2.5	0.18	6.6–7.3	Moderate to very high	Moderate.
95–100	90–95	75–85	0.2–0.8	0.17	6.6–7.3	High	Moderate.
100	85–95	60–70	2.5–5.0	0.10	6.6–7.3	High	Moderate.
95–100	85–95	20–30	5.0–10.0	0.07	([1])	High	Low.
100	95–100	85–95	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
100	90–95	45–55	0.2–0.8	0.17	6.6–7.3	High	Moderate.
85–95	65–75	45–55	2.5–5.0	0.10	6.6–7.3	High	Low or moderate.
95–100	85–95	20–30	5.0–10.0	0.07	([1])	High	Low.
100	95–100	90–95	0.8–2.5	0.21	6.0–6.6	Moderate or high	Low or moderate.
95–100	90–95	75–85	0.2–0.8	0.17	6.6–7.3	High	Moderate.
100	85–95	60–70	2.5–5.0	0.10	6.6–7.3	High	Low or moderate.
95–100	85–95	20–30	5.0–10.0	0.07	([1])	High	Low.
95–100	95–100	80–90	0.8–2.5	0.21	6.1–6.5	High	Moderate.
95–100	95–100	85–95	< 0.05	0.17	5.1–5.5	Moderate or high	High.
95–100	95–100	85–95	< 0.05	0.17	([1])	Moderate or high	High.
95–100	95–100	80–90	0.2–0.8	0.19	6.1–6.5	Moderate or high	Moderate.
95–100	95–100	85–95	< 0.05	0.17	5.1–5.5	Moderate or high	High.
95–100	95–100	85–95	< 0.05	0.17	([1])	Moderate or high	High.
95–100	95–100	85–95	0.8–2.5	0.20	6.6–7.3	Moderate or high	Moderate.
95–100	95–100	85–95	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
---	---	---	2.5–5.0	0.25	4.5–7.3	Moderate	High.
95–100	45–55	20–30	5.0–10.0	0.07	6.6–7.3	Low	Low.
100	95–100	80–90	0.2–0.8	0.21	6.6–7.3	Moderate or high	Moderate.
100	95–100	80–90	0.2–0.8	0.20	6.6–7.3	Moderate or high	Moderate.
---	---	---	2.5–5.0	0.25	4.5–7.3	Moderate	High.
100	95–100	80–90	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
100	95–100	80–90	0.05–0.2	0.19	6.6–7.3	Moderate or high	Moderate.
---	---	---	2.5–5.0	0.25	4.5–7.3	Moderate	High.
100	95–100	85–95	0.8–2.5	0.21	6.6–7.3	Moderate or high	Moderate.
95–100	95–100	80–90	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
95–100	95–100	80–85	0.8–2.5	0.18	6.6–7.3	Moderate to very high	Moderate.
100	95–100	80–90	0.05–0.2	0.19	6.6–7.3	Moderate or high	Moderate.
30–50	10–20	0–10	>10.0	0.03–0.10	([1])	Very low	Low.
100	95–100	80–90	0.2–0.8	0.19	6.6–7.3	Moderate or high	Moderate.
100	95–100	80–90	0.05–0.2	0.19	6.6–7.3	Moderate or high	Moderate.
30–50	10–20	0–10	>10.0	0.03–0.10	([1])	Very low	Low.
95–100	95–100	70–80	2.5–5.0	0.10	6.0–6.5	High	Low or moderate.
100	95–100	80–90	0.05–0.2	0.19	5.1–5.5	Moderate or high	Moderate.
95–100	60–70	30–40	5.0–10.0	0.07	([1])	Moderate to very high	Low or moderate.
95–100	95–100	80–85	0.8–2.5	0.18	6.0–6.5	Moderate to very high	Low or moderate.
100	95–100	80–90	0.05–0.2	0.19	5.1–5.5	Moderate or high	Moderate.
100	60–70	30–40	5.0–10.0	0.07	([1])	Moderate to very high	Low or moderate.
100	95–100	85–95	0.8–2.5	0.21	6.0–6.5	Moderate to very high	Low or moderate.
100	95–100	80–90	0.05–0.2	0.19	5.1–5.5	Moderate or high	Moderate.
100	60–70	30–40	5.0–10.0	0.07	([1])	Moderate to very high	Low or moderate.
---	---	---	2.5–5.0	0.25	6.6–7.3	Moderate	High.
100	100	95–100	<0.05	0.07	([1])	Moderate	High.

[2] No estimates were made. Soil materials are too variable.

TABLE 7.—*Engineering*

Soil series and symbols	Suitability of soils as a source of—			Soil features affecting use for—
	Topsoil	Sand and gravel	Road subgrade [1]	Highway location [1]
Belmore (BeB, BhA, BhB).	Surface layer fair	Fair to good: poorly graded sand and gravel below a depth of 4 feet.	Subsoil fair: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics. Substratum very good.	High susceptibility to frost heave; loose sand and gravel hinder hauling operations.
Berrien (BkA)	Surface layer and subsoil poor: droughtiness; susceptible to erosion.	Fair: poorly graded sand that contains some fines. Substratum unsuitable: contains clay.	Subsoil good: fair shear strength; slight compressibility; low shrink-swell potential; good bearing capacity; fair or good compaction characteristics. Substratum very poor: contains clay.	Cuts and fills needed in many places. Upper part of substratum has low shrink-swell potential. Lower part of substratum contains clay and has moderate shrink-swell potential.
Blount (BlA, BmA, BmB, BmB2).	Surface layer fair. Subsoil poor: thin; clayey.	Unsuitable	Subsoil and substratum poor or very poor: fair or poor shear strength; medium or high compressibility; moderate or high shrink-swell potential; fair bearing capacity; fair or poor compaction characteristics; seasonal high water table.	Moderate or high susceptibility to frost heave; plastic material; seasonal high water table.
Bono (Bn, Bo)	Surface layer fair. Subsoil poor: contains clay; high water table.	Unsuitable	Subsoil very poor: poor shear strength; high compressibility; high shrink-swell potential; fair bearing capacity; fair to poor compaction characteristics; high water table.	Moderate susceptibility to frost heave; plastic material; high water table.
Borrow pits (Bp)	(3)	(3)	(3)	(3)
Brookston (Br, Bs)	Surface layer fair: high water table. Subsoil fair or poor: contains clay; high water table.	Unsuitable	Subsoil poor or very poor: fair or poor shear strength; high shrink-swell potential; medium or high compressibility; fair bearing capacity; fair or poor compaction characteristics; high water table.	Moderate or high shrink-swell potential; plastic material; high water table; moderate to high susceptibility to frost heave.
Carlisle (Ca)	Poor: susceptible to erosion; oxidizes rapidly.	Unsuitable	Very poor: poor stability; high water table.	Poor stability; high water table.
Chelsea (ChB, ChC, ChD).	Surface layer and subsoil poor: droughtiness.	Fair: appreciable fines in sand.	Subsoil and substratum fair or good: fair shear strength; slight compressibility; low shrink-swell potential; good bearing capacity; fair or good compaction characteristics.	Low shrink-swell potential; loose sandy material hinders hauling operations; cuts and fills needed in many places; side slopes difficult to stabilize; low susceptibility to frost heave.

See footnotes at end of table.

interpretations of the soils

Soil features affecting use for—Continued			Degree of limitation [2] for—	
Agricultural drainage	Pond reservoir	Pond embankments, dikes, and levees	Foundations of buildings [1]	Septic tank disposal fields
Not needed	Material below a depth of about 4 feet too porous to hold water.	Subsoil: fair or good stability; fair or good compaction characteristics. Substratum: rapid permeability when compacted.	Severe: Subsoil: fair bearing capacity; moderate shrink-swell potential; fair shear strength. Substratum: moderate limitation if soil material not confined.	Slight: possible contamination of water sources.
Not needed	Material above substratum has rapid permeability; normally suitable for excavated ponds.	Material above substratum has rapid permeability when compacted. Substratum has fair to good stability; fair to good compaction characteristics; slow permeability when compacted.	Moderate or severe: moderate shrink-swell potential; fair bearing capacity.	Slight: possible contamination of nearby water sources.
Seasonal high water table; slow permeability.	Medium or slow seepage rate; normally suitable for excavated ponds; seasonal high water table.	Fair or good compaction characteristics; fair or good stability; moderate to high shrink-swell potential in subsoil; seasonal high water table.	Severe: fair bearing capacity; moderate shrink-swell potential; fair shear strength; seasonal high water table.	Severe: seasonal high water table; slow permeability.
Very slow permeability; high water table.	High water table; slow seepage rate; normally suitable for excavated ponds.	High shrink-swell potential; fair or poor stability; fair or poor compaction characteristics; high water table.	Severe: fair bearing capacity; high shrink-swell potential; poor shear strength; high water table.	Severe: high water table; very slow permeability.
(3)	(3)	(3)	(3)	(3).
Slow permeability; high water table.	High water table; medium or slow seepage rate; normally suitable for excavated ponds.	Subsoil: fair or poor stability; fair or poor compaction characteristics; high shrink-swell potential. Substratum: poor stability; poor compaction characteristics; low or moderate shrink-swell potential; high water table.	Severe: fair or poor bearing capacity; low or moderate shrink-swell potential; fair or poor shear strength; high water table.	Severe: high water table; slow permeability.
Subsidence of organic material; high water table.	Rapid seepage rate; high water table; normally suitable for excavated ponds.	Pervious; poor stability; high water table.	Severe: poor stability; very high compressibility; high water table.	Severe: high water table.
Not needed	Too porous to hold water.	Pervious when compacted	Moderate: good bearing capacity; low shrink-swell potential; fair shear strength.	Slight: possible contamination of nearby water sources.

TABLE 7.—*Engineering interpretations*

Soil series and symbols	Suitability of soils as a source of—			Soil features affecting use for—
	Topsoil	Sand and gravel	Road subgrade [1]	Highway location [1]
Crosby (CrA, CsA, CsB, CsB2).	Surface layer good. Subsoil fair: contains clay; seasonal high water table.	Unsuitable	Subsoil poor: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics. Substratum fair or poor: fair or poor shear strength; medium compressibility; moderate shrink-swell potential; fair or poor bearing capacity; fair or poor compaction characteristics; seasonal high water table.	Moderate or high susceptibility to frost heave; plastic material; seasonal high water table.
Del Rey (Dr).	Surface layer good. Subsoil fair: contains clay; seasonal high water table.	Unsuitable	Subsoil and substratum poor: fair shear strength; medium or high compressibility; moderate or high shrink-swell potential; fair bearing capacity; fair or good compaction characteristics; seasonal high water table.	Moderate or high susceptibility to frost heave; plastic material; seasonal high water table.
Eel (Ee, Es)	Good or fair: flood hazard.	Unsuitable	Substratum poor: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics; flood hazard.	Moderate or high susceptibility to frost heave; plastic material; flood hazard.
Fox (FmA, FmB, FmC2).	Surface layer good. Subsoil poor or fair: contains gravel and clay.	Good below a depth of 20 to 40 inches: poorly graded sand and gravel.	Subsoil poor: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics. Substratum very good.	Subsoil has high susceptibility to frost heave; plastic material. Substratum easy to excavate; loose material hinders hauling operations; good bearing capacity if soil material is confined.
Genesee (Ge, Gh, Gm, Gn).	Good or fair: flood hazard.	Unsuitable	Substratum fair: poor shear strength; medium compressibility; low or moderate shrink-swell potential; poor bearing capacity; poor compaction characteristics; flood hazard.	Moderate to very high susceptibility to frost heave; flood hazard.
Gilford (Go)	Surface layer good. Subsoil fair: high water table; low in organic matter.	Fair below a depth of 40 inches: sand that contains appreciable fines.	Subsoil fair: poor shear strength; medium compressibility; low or moderate shrink-swell potential; poor bearing capacity; poor compaction characteristics. Substratum fair to good: fair shear strength; slight compressibility; low to moderate shrink-swell potential; good bearing capacity; fair or good compaction characteristics; high water table.	High susceptibility to frost heave; high water table.
Gravel pits (Gp)	(3)	(3)	(3)	(3)

See footnotes at end of table.

of the soils—Continued

Soil features affecting use for—Continued			Degree of limitation [2] for—	
Agricultural drainage	Pond reservoir	Pond embankments, dikes, and levees	Foundations of buildings [1]	Septic tank disposal fields
Seasonal high water table; moderately slow permeability.	Seasonal high water table; moderately slow permeability; normally suitable for excavated ponds.	Subsoil: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; subject to piping; moderate shrink-swell potential. Substratum: fair or poor stability, fair or poor compaction characteristics; moderate or slow permeability when compacted; medium to high compressibility; subject to piping; moderate shrink-swell potential; seasonal high water table.	Severe: moderate shrink-swell potential; fair or poor bearing capacity; fair or poor shear strength; seasonal high water table.	Severe: seasonal high water table; moderately slow permeability.
Seasonal high water table; moderately slow permeability.	Seasonal high water table; medium or slow seepage rate.	Fair or good stability; fair or good compaction characteristics; slow permeability if compacted; medium or high compressibility; moderate or high shrink-swell potential; seasonal high water table.	Severe: fair bearing capacity; moderate or high shrink-swell potential; fair shear strength; seasonal high water table.	Severe: moderately slow permeability; seasonal high water table.
Flood hazard	Flood hazard; medium or slow seepage rate.	Fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium to high compressibility; moderate shrink-swell potential.	Severe: fair bearing capacity; moderate or high shrink-swell potential; fair shear strength; flood hazard.	Severe: flood hazard.
Not needed	Rapid seepage rate	Rapid seepage rate; subject to piping.	Moderate: good bearing capacity if soil material is confined; low shrink-swell potential; good shear strength.	Slight: possible contamination of nearby water sources.
Flood hazard	Flood hazard; medium or slow seepage rate.	Poor stability; poor compaction characteristics; moderate permeability when compacted; medium compressibility.	Severe: poor bearing capacity; poor shear strength; low or moderate shrink-swell potential; flood hazard.	Severe: flood hazard.
High water table; moderate permeability above a depth of 40 inches, and rapid below that depth.	High water table; rapid seepage rate in substratum; normally suitable for excavated ponds.	Subsoil: poor stability; poor compaction characteristics; moderate permeability when compacted; medium compressibility. Substratum: fair stability; fair or good compaction characteristics; moderate permeability when compacted; slight compressibility; high water table; subject to piping.	Severe: high water table.	Severe: high water table.
(3)	(3)	(3)	(3)	(3).

TABLE 7.—*Engineering interpretations*

Soil series and symbols	Suitability of soils as a source of— Topsoil	Sand and gravel	Road subgrade [1]	Soil features affecting use for— Highway location [1]
Haskins (HaA, HaB)	Surface layer fair. Subsoil fair: contains some clay.	Unsuitable	Subsoil fair: fair or poor shear strength; medium compressibility; low or moderate shrink-swell potential; fair or poor bearing capacity; poor compaction characteristics. Substratum poor; fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics; high water table.	High susceptibility to frost heave; plastic material; high water table.
Hoytville (Hs)	Surface layer fair: clayey. Subsoil poor: clayey, high water table.	Unsuitable	Subsoil and substratum very poor: poor shear strength; high compressibility; high shrink-swell potential; fair bearing capacity; fair or poor compaction characteristics; high water table.	Moderate susceptibility to frost heave; high water table; plastic material.
Lenawee (Le, Ls)	Surface layer fair: contains clay; thin. Subsoil poor: contains clay; high water table.	Unsuitable	Subsoil and substratum poor: fair shear strength; medium or high compressibility; high shrink-swell potential; fair bearing capacity; fair or good compaction characteristics; high water table.	Moderate susceptibility to frost heave; high water table; plastic material.
Linwood (Lw)	Poor: susceptible to erosion; oxidizes rapidly; high water table.	Unsuitable	Muck material not suitable. Substratum fair: poor shear strength; medium compressibility; low or moderate shrink-swell potential; poor bearing capacity; poor compaction characteristics; high water table.	Muck material unstable; high water table.
Made land (Ma)	(3)	(3)	(3)	(3)
Martinsville: (McA, McB, McB2, McC2, MfA, MgC3).	Surface layer good. Subsoil fair: clayey.	Unsuitable	Subsoil fair or poor: good or fair shear strength; medium compressibility; moderate shrink-swell potential; good or fair bearing capacity; good or fair compaction characteristics. Substratum good or fair: fair shear strength; slight compressibility; low shrink-swell potential; good bearing capacity; fair or good compaction characteristics.	Fair or good stability; fair to good compaction characteristics; slow or moderate permeability when compacted. Subsoil has high susceptibility to frost heave. Substratum has moderate to very high susceptibility to frost heave.
(MeA, MeB)	Surface layer good. Subsoil fair: contains clay.	Good to fair below a depth of 40 to 60 inches: poorly graded gravel and sand.	Subsoil poor: fair or good shear strength; medium compressibility; low or moderate shrink-swell potential; fair or good bearing capacity; fair or good compaction characteristics. Substratum very good: good shear strength; very slight compressibility; low shrink-swell potential; good bearing capacity if soil material is confined; fair compaction characteristics.	Subsoil has high susceptibility to frost heave. Substratum has very low susceptibility to frost heave; easy to haul; poor stability; good bearing capacity if soil material is confined.

See footnotes at end of table.

of the soils—Continued

Soil features affecting use for—Continued			Degree of limitation [2] for—	
Agricultural drainage	Pond reservoir	Pond embankments, dikes, and levees	Foundations of buildings [1]	Septic tank disposal fields
High water table; moderately slow permeability.	High water table; moderately slow permeability.	Subsoil: poor stability; poor compaction characteristics; moderate permeability when compacted; medium compressibility. Substratum: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; high water table.	Severe: fair bearing capacity; moderate shrink-swell potential fair shear strength; high water table.	Severe: moderately slow permeability; high water table.
High water table; slow permeability.	High water table; slow seepage rate; normally suitable for excavated ponds.	Subsoil and substratum: fair or poor stability; fair or poor compaction characteristics; slow permeability when compacted; high compressibility; high shrink-swell potential; high water table.	Severe: fair bearing capacity; high shrink-swell potential; poor shear strength; high water table.	Severe: slow permeability; high water table.
High water table; moderately slow permeability in subsoil.	High water table; slow seepage rate; normally suitable for excavated ponds.	Subsoil and substratum: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; high water table.	Severe: fair bearing capacity; high shrink-swell potential; fair shear strength; high water table.	Severe: slow permeability; high water table.
High water table; subsidence of organic material.	High water table; rapid seepage rate; normally suitable for excavated ponds.	Organic material not suited. Substratum: poor stability; poor compaction characteristics; moderate permeability when compacted; medium compressibility; high water table.	Severe: poor bearing capacity; low or moderate shrink-swell potential; poor shear strength; high water table.	Severe: high water table.
(3)	(3)	(3)	(3)	(3).
Not needed	Medium or slow seepage rate; compacted seal blanket may be needed.	Subsoil: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium compressibility. Substratum: fair stability; fair or good compaction characteristics; moderate permeability when compacted; slight compressibility.	Moderate: good bearing capacity; low shrink-swell potential; fair shear strength.	Slight; moderate limitation on slopes of 6 to 12 percent.
Not needed	Very rapid seepage rate; material below a depth of 40 to 60 inches too porous to hold water.	Subsoil: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium compressibility. Substratum: fair stability; fair compaction characteristics; rapid permeability when compacted; very slight compressibility.	Moderate: good bearing capacity if soil material is confined; low shrink-swell potential; good shear strength.	Slight: possible contamination of nearby water sources.

TABLE 7.—*Engineering interpretations*

Soil series and symbols	Suitability of soils as a source of—			Soil features affecting use for—
	Topsoil	Sand and gravel	Road subgrade [1]	Highway location
Mermill (Mh)	Surface layer good. Subsoil fair: high water table.	Unsuitable	Subsoil poor: fair shear strength; medium or high compressibility; moderate or high shrink-swell potential; fair bearing capacity; fair or good compaction characteristics. Substratum poor or very poor: fair or poor shear strength; high compressibility; high shrink-swell potential; high water table.	Moderate or high susceptibility to frost heave; plastic material; high water table.
Miami (MkB2, MlC2, MmC3).	Surface layer good. Subsoil fair: contains some clay.	Unsuitable	Subsoil fair: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics. Substratum fair: fair or poor shear strength; medium compressibility; low or moderate shrink-swell potential; fair or good bearing capacity; poor compaction characteristics.	Moderate to very high susceptibility to frost heave; plastic subsoil material; fair or poor bearing capacity; cuts and fills needed in many places.
Montgomery (Mn, Mo).	Surface layer fair; clayey. Subsoil poor: clayey; high water table.	Unsuitable	Subsoil and substratum very poor: poor shear strength; high compressibility; high shrink-swell potential; fair bearing capacity; fair or poor compaction characteristics; high water table.	Moderate susceptibility to frost heave; plastic material; high water table; fair bearing capacity.
Morley (MrB, MrB2, MrC, MrC2, MrD2, MrE2, MsB3, MsC3, MsD3, MsE3).	Surface layer fair: thin. Subsoil poor: clayey.	Unsuitable	Subsoil and substratum poor to very poor: fair or poor shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or poor compaction characteristics.	Moderate or high susceptibility to frost heave; plastic material; fair bearing capacity; cuts and fills needed in many places.
Nappanee (Na, Np)	Surface layer fair or poor: thin; seasonal high water table.	Unsuitable	Subsoil and substratum very poor: poor shear strength; high compressibility; high shrink-swell potential; fair bearing capacity; fair or poor compaction characteristics; seasonal high water table.	Moderate susceptibility to frost heave; plastic material; seasonal high water table; fair or poor compaction characteristics; fair bearing capacity.
Oshtemo:				
(OfA, OfB, OfC2).	Surface layer poor: droughtiness. Sub soil fair.	Fair below a depth of about 42 inches; sand that contains appreciable fines.	Subsoil fair: fair or poor shear strength; medium compressibility; low or moderate shrink-swell potential; fair or poor bearing capacity; poor compaction characteristics. Substratum fair or good: fair shear strength; slight compressibility; low shrink-swell potential; good bearing capacity; fair or good compaction characteristics.	Moderate or high susceptibility to frost heave; cuts and fills needed in many places; fair or poor stability; fair bearing capacity.
(OsA, OsB)	Surface layer poor: droughtiness. Subsoil fair.	Fair to good below a depth of about 42 inches; gravel poorly graded.	Subsoil fair: fair or poor shear strength; medium compressibility; low or moderate shrink-swell potential; fair or poor bearing capacity; poor compaction characteristics. Substratum very good: good shear strength; very slight compressibility; low shrink-swell potential; good bearing capacity if soil material is confined; good compaction characteristics.	Moderate or high susceptibility to frost heave above substratum; cuts and fills needed; fair or poor stability. Subsoil has poor or fair bearing capacity. Substratum has good bearing capacity if soil material is confined; easy to excavate and haul.

of the soils—Continued

Soil features affecting use for—Continued			Degree of limitation [2] for—	
Agricultural drainage	Pond reservoir	Pond embankments, dikes, and levees	Foundations of buildings [1]	Septic tank disposal fields
High water table; slow permeability.	Medium or slow seepage rate; high water table; normally suitable for excavated ponds.	Subsoil and substratum: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; high shrink-swell potential; high water table.	Severe: fair bearing capacity; high shrink-swell potential; poor shear strength; high water table.	Severe: high water table; slow permeability.
Not needed	Medium or slow seepage rate.	Subsoil: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; subject to piping. Substratum: poor stability; poor compaction characteristics; moderate permeability when compacted; medium compressibility.	Severe: fair or poor bearing capacity; low or moderate shrink-swell potential; fair or poor shear strength.	Moderate: permeability of subsoil 0.2 to 0.8 inch per hour; severe limitation on slopes of more than 12 percent.
High water table; very slow permeability.	High water table; slow seepage rate; normally suitable for excavated ponds.	Subsoil and substratum: fair or poor stability; fair or poor compaction characteristics; slow permeability when compacted; high compressibility; high shrink-swell potential; high water table.	Severe: fair bearing capacity; high shrink-swell potential; poor shear strength; high water table.	Severe: high water table; very slow permeability.
Not needed	Slow seepage rate	Subsoil and substratum: fair stability; fair compaction characteristics; slow permeability when compacted; medium or high compressibility; moderate shrink-swell potential; subject to piping.	Moderate or severe: fair bearing capacity; moderate shrink-swell potential; fair shear strength.	Severe: slow permeability.
Seasonal high water table; very slow permeability.	Slow seepage rate; seasonal high water table.	Subsoil and substratum: fair or poor stability; fair or poor compaction characteristics; slow permeability when compacted; high compressibility; high shrink-swell potential; seasonal high water table.	Severe: fair bearing capacity; high shrink-swell potential; poor shear strength; seasonal high water table.	Severe: very slow permeability; seasonal high water table.
Not needed	Medium or rapid seepage rate; porous substratum.	Subsoil: poor stability; poor compaction characteristics; moderate permeability when compacted; medium compressibility. Substratum: fair stability; fair or poor compaction characteristics; moderate permeability when compacted; slight compressibility.	Moderate: good bearing capacity; low shrink-swell potential; fair shear strength.	Slight: possible contamination of nearby water sources; moderate limitation on slopes of 6 to 12 percent.
Not needed	Medium or rapid seepage rate; very porous substratum.	Subsoil: poor stability; poor compaction characteristics; moderate permeability when compacted; medium compressibility. Substratum: fair stability; good compaction characteristics; rapid permeability when compacted; very slight compressibility.	Moderate if soil material is confined; good bearing capacity if confined; low shrink-swell potential; good shear strength.	Slight: possible contamination of nearby water sources.

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TABLE 7.—*Engineering interpretations*

Soil series and symbols	Suitability of soils as a source of—			Soil features affecting use for—
	Topsoil	Sand and gravel	Road subgrade [1]	Highway location [1]
Pewamo (Pc, Pe)	Surface layer fair: contains clay. Subsoil poor: clayey; high water table.	Unsuitable	Subsoil very poor: poor shear strength; high compressibility; high shrink-swell potential; fair bearing capacity; fair or poor compaction characteristics. Substratum poor: fair shear strength; medium or high compressibility; moderate or high shrink-swell potential; fair bearing capacity; fair or good compaction characteristics; high water table.	Moderate susceptibility to frost heave; plastic material; high water table; fair bearing capacity.
Plainfield (PlB, PlC)	Surface layer poor: droughtiness. Subsoil poor: droughtiness; low content of organic matter.	Fair to a depth of 42 to 70 inches; sand that contains appreciable fines.	Subsoil good: fair shear strength; slight compressibility; low shrink-swell potential; good bearing capacity; fair or good compaction characteristics. Substratum poor: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics.	Susceptibility to frost heave is high to a depth of about 36 inches, low between depths of 36 to 55 inches, and moderate to high below a depth of 55 inches; fair stability above lower part of substratum; sandy material easy to excavate but hinders hauling operations.
Rawson (RaB, RlA, RlB2, RlC2).	Surface layer good. Subsoil fair: contains clay.	Unsuitable	Subsoil and substratum poor or very poor: poor or fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair compaction characteristics.	Moderate or high susceptibility to frost heave; plastic material; fair stability; cuts and fills needed; fair bearing capacity.
Rensselaer (Rm, Rn, Ro, Rs).	Surface layer good. Subsoil fair to poor: contains clay; high water table.	Unsuitable	Subsoil poor: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics. Substratum good: fair shear strength; slight compressibility; low shrink-swell potential; good bearing capacity; fair or good compaction characteristics; high water table.	High susceptibility to frost heave; plastic material in subsoil; fair stability; high water table.
St. Clair (SaB, ScB2, ScC2).	Surface layer fair: thin. Subsoil poor: clayey.	Unsuitable	Subsoil and substratum poor or very poor: fair or poor shear strength; medium or high compressibility; high shrink-swell potential; fair bearing capacity; fair compaction characteristics.	Moderate to high susceptibility to frost heave; plastic material; fair bearing capacity; fair stability.
Shoals (Sh)	Surface layer and subsoil good to fair: high water table; flood hazard.	Unsuitable	Subsoil and substratum poor: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics; high water table.	Moderate to high susceptibility to frost heave; plastic material; fair bearing capacity; fair or good stability; high water table; flood hazard.
Tawas (Ta)	Poor: susceptible to erosion; oxidizes rapidly; high water table.	Fair below organic material; sand that contains appreciable fines; high water table.	Organic material not suitable. Substratum good: fair shear strength; slight compressibility; low shrink-swell potential; good bearing capacity; fair or good compaction characteristics; high water table.	Organic material 12 to 42 inches thick over sandy material; high water table.

of the soils—Continued

Soil features affecting use for—Continued			Degree of limitation [2] for—	
Agricultural drainage	Pond reservoir	Pond embankments, dikes, and levees	Foundations of buildings [1]	Septic tank disposal fields
High water table; slow permeability.	High water table; slow seepage rate; normally suitable for excavated ponds.	Subsoil: fair or poor stability; fair or poor compaction characteristics; slow permeability when compacted; high compressibility; high shrink-swell potential. Substratum: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; moderate shrink-swell potential; high water table.	Severe: fair bearing capacity; moderate shrink-swell potential; fair shear strength; high water table.	Severe: high water table; slow permeability.
Not needed	Rapid seepage rate	Subsoil: fair stability; fair or good compaction characteristics; moderate permeability when compacted; slight compressibility. Substratum: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility.	Severe: fair bearing capacity; moderate shrink-swell potential; fair shear strength.	Slight: possible contamination of nearby water sources; moderate limitation on slopes of 6 to 12 percent.
Not needed	Medium or slow seepage rate.	Subsoil and substratum: fair stability; fair compaction characteristics; slow permeability when compacted; medium or high compressibility; subject to piping; moderate shrink-swell potential.	Severe: fair bearing capacity; moderate shrink-swell potential; fair shear strength.	Severe: slow permeability.
High water table; moderately slow permeability.	Medium or slow seepage rate; normally suitable for excavated ponds; high water table.	Subsoil fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; moderate shrink-swell potential. Substratum: fair stability; fair or poor compaction characteristics; moderate permeability when compacted; slight compressibility; high water table.	Severe: good bearing capacity; low shrink-swell potential; fair shear strength; high water table.	Severe: high water table; moderately slow permeability.
Not needed	Slow seepage rate	Subsoil and substratum: fair stability; fair compaction characteristics; slow permeability when compacted; medium or high compressibility; high shrink-swell potential.	Severe: fair bearing capacity; high shrink-swell potential; fair or poor shear strength.	Severe: very slow permeability.
High water table; flood hazard.	High water table; flood hazard; slow seepage rate.	Subsoil and substratum: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; high water table.	Severe: fair bearing capacity; moderate shrink-swell potential; fair shear strength; high water table.	Severe: high water table; flood hazard.
Subsidence of organic material; high water table; lack of outlets.	High water table; pervious; normally suitable for excavated ponds.	Organic material not suitable. Substratum: fair stability; fair or good compaction characteristics; moderate permeability when compacted; slight compressibility; high water table.	Severe: high water table	Severe: high water table.

TABLE 7.—*Engineering interpretations*

Soil series and symbols	Suitability of soils as a source of—			Soil features affecting use for—
	Topsoil	Sand and gravel	Road subgrade [1]	Highway location [1]
Wallkill (Wa, Wc)	Good or fair: flood hazard; high water table.	Unsuitable	10 to 36 inches of mineral soil above peat fair to poor: fair or poor shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or poor compaction characteristics; high water table. Underlying organic material not suitable.	High water table; organic material has poor bearing capacity; poor stability; flood hazard.
Washtenaw (Wh)	Surface layer good. Surface layer of old buried soil poor: contains clay; high water table.	Unsuitable	Poor: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics; high water table.	Moderate to high susceptibility to frost heave; plastic material; fair or good stability; fair bearing capacity; high water table.
Westland (Ws, Wt)	Surface layer fair. Subsoil fair or poor: contains clay; high water table.	Fair to good below a depth of about 42 inches; gravel poorly graded; high water table.	Subsoil poor: fair shear strength; medium or high compressibility; moderate or high shrink-swell potential; fair bearing capacity; fair or good compaction characteristics. Substratum very good: good shear strength; very slight compressibility; low shrink-swell potential; good bearing capacity if soil material is confined; good compaction characteristics; high water table.	Subsoil has moderate to high susceptibility to frost heave; fair bearing capacity. Substratum has very low susceptibility to frost heave; good bearing capacity if soil material is confined; high water table.
Whitaker (HnA, HoA, HoB, HpA).	Surface layer good. Subsoil fair: somewhat clayey; high water table.	Fair below a depth about 40 inches: contains appreciable fines; high water table.	Subsoil poor: fair shear strength; medium or high compressibility; moderate shrink-swell potential; fair bearing capacity; fair or good compaction characteristics. Substratum fair or good: fair or poor shear strength; slight or medium compressibility; low or moderate shrink-swell potential; good or poor bearing capacity; fair or poor compaction characteristics; high water table.	Moderate or very high susceptibility to frost heave; high water table.
Willette (Wu)	Poor: susceptible to erosion; oxidizes rapidly; high water table.	Unsuitable	Organic material not suitable. Substratum very poor: poor shear strength; high compressibility; high shrink-swell potential; fair bearing capacity; fair or poor compaction characteristics; high water table.	High susceptibility to frost heave; poor bearing capacity; poor stability; high water table.

[1] Engineers and others should not apply specific values to estimates of bearing capacity.
[2] *Slight* means that the limitations are easily overcome, *moderate* indicates that overcoming the limitations is generally feasible, and *severe* indicates that the use of the soil for this purpose is questionable.

of the soils—Continued

Soil features affecting use for—Continued			Degree of limitation [2] for—	
Agricultural drainage	Pond reservoir	Pond embankments, dikes, and levees	Foundations of buildings [1]	Septic tank disposal fields
High water table; flood hazard; subsidence of organic material.	High water table; flood hazard; normally suitable for excavated ponds.	High water table; organic material unstable and not suitable.	Severe: high water table; poor bearing capacity; poor shear strength; high shrink-swell potential.	Severe: high water table; flood hazard.
High water table; moderately slow permeability.	Medium or slow seepage rate; high water table; normally suitable for excavated ponds.	Fair to good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; moderate shrink-swell potential; high water table.	Severe: fair bearing capacity; moderate shrink-swell potential; fair shear strength; high water table.	Severe: moderately slow permeability; high water table.
High water table; slow permeability.	Rapid seepage rate; high water table; normally suitable for excavated ponds.	Subsoil: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility; moderate shrink-swell potential. Substratum: fair stability; good compaction characteristics; rapid permeability when compacted; very slight compressibility; high water table.	Severe: good bearing capacity if soil material is confined; low shrink-swell potential; good shear strength; high water table.	Severe: slow permeability; high water table.
High water table----	High water table; rapid seepage rate; pervious substratum.	Subsoil: fair or good stability; fair or good compaction characteristics; slow permeability when compacted; medium or high compressibility. Substratum: poor stability; fair or poor compaction characteristics; moderate permeability when compacted; slight or medium compressibility; subject to piping; high water table.	Severe: fair or good bearing capacity; low or moderate shrink-swell potential; poor or fair shear strength; high water table.	Severe: moderately slow permeability; high water table.
High water table; subsidence of organic material.	High water table; normally suitable for excavated ponds.	Organic material unstable and not suitable. Substratum: fair or poor stability; fair or poor compaction characteristics; slow permeability when compacted; high compressibility; high shrink-swell potential; high water table.	Severe; fair bearing capacity; high shrink-swell potential; poor shear strength; high water table.	Severe: high water table.

[3] No valid interpretations possible. Soil material is too variable.

The soil features considered for highway location are those that affect the overall performance of an undisturbed soil that has not been artificially drained. The entire profile is evaluated. Some of the features are susceptibility to frost heave, texture, shrink-swell potential, and depth to water table.

For agricultural drainage, the features considered are those that affect the installation and performance of drainage systems, both on the surface and beneath the surface. Some of the features are texture, permeability, topography, seasonal water table, and restricting layers.

The feature of primary concern in building a pond reservoir is the seepage rate of the undisturbed soil.

Pond embankments, dikes, and levees are built with disturbed soil material and are used to impound water. Among the features affecting the suitability of soil material for use in such structures are stability, compaction, compressibility, shrink-swell potential, permeability, and depth to water table.

For foundations of buildings, the degree of limitation is based on the characteristics of the substratum, which provides the base for most building foundations. Some of the limiting features are poor bearing capacity, high shrink-swell potential, poor shear strength, flood hazard, and a high water table.

Among the features that limit soils for use as septic tank disposal fields are slow permeability, a high water table, flood hazard, and topography.

Engineers and others should not apply specific values to the estimates of bearing capacity given in this table.

Formation and Classification of the Soils

This section discusses the factors of soil formation, the processes of soil formation, and the classification of the soils in Allen County by higher categories.

Factors of Soil Formation

The factors that determine the kind of soil that forms at any given point are the composition of the parent material, the climate under which the soil material accumulated and weathered, the living organisms on and in the soil, the relief, or lay of the land, and time. Each of these factors modifies the effects of the other four.

Climate and vegetation are the active factors of soil formation. They act on the accumulated soil material and slowly change it into a natural body with genetically related horizons. Relief, mainly by its influence on temperature and runoff, modifies the effect of climate and vegetation. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into a soil profile. Usually a long time is required for the development of distinct horizons.

Differences in parent material and relief account for most of the differences among the soils of Allen County. The effects of climate, living organisms, and time have been practically uniform throughout the county.

Parent material

In most of Allen County the parent material was the Wisconsin glacial drift that made up the ground moraines and the Salamonie, Wabash, and Fort Wayne terminal moraines (fig. 14). This drift consists of silty and clayey material mixed with varying amounts of sand and gravel-size to boulder-size rock fragments. It is 40 to 250 feet thick. It is thinnest in the eastern part of the county and thickest in the north-central part. In a diagonal strip that runs from northeast to southwest through the center of the county, it is between 100 and 200 feet thick. Soils that formed in this material make up about 82 percent of the county.

Other parent materials of glacial origin were the outwash on plains and terraces of the Wabash sluiceway and the Eel River sluiceway (fig. 14) and the material deposited in the eastern part of the county by the wide, shallow, glacial Lake Maumee. The soils that formed in these silty and clayey lake deposits are finer textured than the generally sandy and gravelly soils that formed in the outwash. Soils that formed in these two kinds of parent materials make up about 13 percent of the county.

On the flood plains of the present rivers and streams, the parent material was alluvium of Recent age. The periodically flooded soils that formed in alluvium make up about 3 percent of the county.

Other parent materials of Recent age are the partly decayed remains of water-tolerant grasses and trees that grew in the deep depressions. Two large areas of organic soils that formed from such materials are in the Wabash sluiceway and the Eel River sluiceway; other areas occur in the northwestern part of the county. These soils make up about 2 percent of the county.

Climate

Rainfall, temperature, and wind are among the climatic forces that promote the weathering of parent material and the activity of living organisms.

The climate in Allen County is characterized by hot summers and humid, cold winters. Rainfall averages about 35 inches a year. It is fairly well distributed throughout the year but is slightly greater in spring than in other seasons. The climate is uniform throughout the county and, consequently, does not account for significant differences among the soils.

Living organisms

Living organisms, plants especially, are active forces in soil development. As plants die and decay, they contribute organic matter to the soils. Deep-rooted plants utilize plant nutrients from the lower layers of the soil and then return some of the nutrients to the surface layer. Bacteria and fungi promote the decomposition of plant remains and the incorporation of the organic matter into the soil.

The native vegetation in Allen County consisted mostly of deciduous trees, but water-tolerant grasses and sedges grew in some level, wet areas, along with a few water-tolerant trees. Soils that form under marsh grass and trees have a thicker, darker colored surface layer than soils that form mainly under forest vegetation, because organic matter accumulates more rapidly under grass. Grass roots decay in the soil each year. Under forest vegetation, organic matter is derived mostly from leaves that fall on the surface. The soils of the Pewamo and Hoytville series are

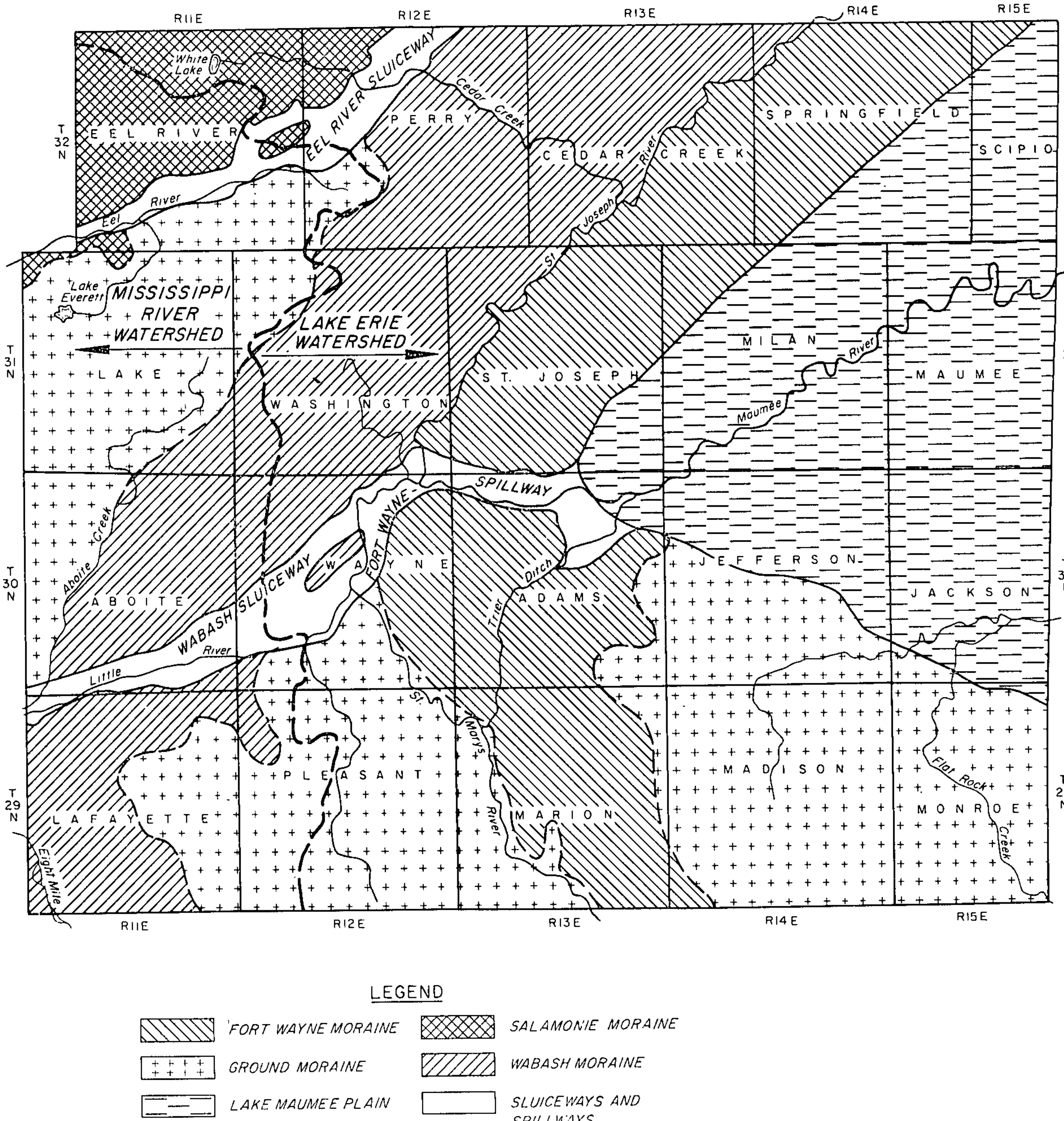

***Figure 14.*—Geologic formations that make up the parent materials of soils in Allen County. Also shown is the divide between the Lake Erie watershed and the Mississippi River watershed.**

examples of soils that formed under marsh grass and trees. Those of the Morley and Fox series are examples of soils that formed under forest vegetation.

Relief

Relief influences the formation of soils through its effect on drainage, runoff, and erosion. In Allen County the relief is predominantly level to gently sloping and is steep only in a few small areas.

An example of the influence of relief on drainage, and, in turn, on the morphology of the soils is shown in the soils of the Pewamo-Blount-Morley catena, which formed in similar parent material—glacial till of silty clay loam or clay loam texture—under similar climate. The Pewamo soils, which are slightly depressional or level and have very poor drainage, are dark colored and have a grayish subsoil; the Blount soils, which are nearly level to gently sloping and have somewhat poor drainage, are moderately dark colored and have a mottled gray and yellowish-brown subsoil; and the Morley soils, which are gently sloping to strongly sloping and have moderately good drainage, are moderately dark colored and have a brown to yellowish-brown subsoil.

Time

Time is necessary for the formation of soil from parent material. The length of time required depends largely on the combined action of the other soil-forming factors. If

all the other factors are favorable, the time required for the formation of some soils may be relatively short, perhaps a century or two, but if there is one unfavorable factor, such as resistant parent material, then it may be much longer.

In Allen County there is little difference in the age of the normal, or mature, soils and little difference in the age of the parent materials in which they formed. The soils that formed in glacial till are slightly older than the soils that formed in the lacustrine deposits associated with glacial Lake Maumee and the sluiceways, or channels, through which it drained. The soils that formed in alluvium, in organic materials, and on steep topography are of more recent origin and show little or no evidence of horizon differentiation.

Processes of Soil Formation

The differentiation of horizons in the soils of the county involved several processes. The most important are (1) the accumulation of organic matter, (2) the leaching of carbonates and salts more soluble than calcium carbonate, (3) the translocation of silicate clay minerals from one horizon to another, and (4) the reduction and transfer of iron. In all the soils most of these processes have taken place, but the effect varies from soil to soil.

In all the soils of Allen County, organic matter has accumulated in the uppermost layers, and thus an A1 horizon has formed. In some of the soils, this horizon cannot be identified now, because it has been mostly or entirely lost through erosion or because it has been mixed with part of the subsoil through cultivation. Much of the organic matter is in the form of humus. The organic-matter content is low in Chelsea soils, relatively high in Hoytville and Pewamo soils, and very high in Carlisle soils.

Leaching of carbonates and other salts has taken place in almost all the soils of the county. The well-drained soils generally are completely leached, but leaching is slow in the poorly drained or wet soils because water moves slowly through those soils. Leaching has had little effect on alluvial soils because these soils have not been in place long enough. Leaching precedes and permits the translocation of silicate minerals in most soils.

The translocation of silicate clay minerals has influenced the development of horizons in most soils of the county. The clay has moved downward from the A horizon and has accumulated in the B horizon. Genesee, Eel, and a few other soils in Allen County lack evidence of a textural B horizon.

In the formation of silicate clays, some iron is usually freed as hydrated oxide, which is more or less strongly red in color, depending on the degree of hydration. Morley, Miami, and Fox are examples of soils having iron freed as hydrated oxide. A small amount of this oxide is sufficient to color the soil, particularly if the silicate clay minerals are not abundant and if the parent material of the soil was fairly coarse textured. This process results in the formation of a color B horizon, even in places where there are not enough accumulated clay minerals to form a textural B horizon. Chelsea soils have a color B horizon and little evidence of a textural B horizon. In most soils, however, the B horizon is textural as well as strongly colored.

Most of the soils in Allen County formed through the process of podzolization, which is most active under forest vegetation and in a relatively cool, humid climate. In this process percolating water carries the clay downward from the upper layers and deposits it as films along channels or on the surfaces of aggregates in the B horizon. Organic acids formed by the decomposition of organic matter in the surface layer remove manganese, iron, and other dark-colored minerals as they move downward and so produce an A2 horizon that is lighter colored than the rest of the solum. Some of the soils that have been affected by podzolization are the Morley, Miami, Blount, and Crosby soils.

Reduction and transfer of iron, a process called gleying, has taken place in Hoytville, Blount, and other somewhat poorly drained and poorly drained soils. It has also taken place to some extent in the deeper horizons of St. Clair and other well drained and moderately well drained soils. Gray colors in the deeper horizons of wet soils, such as Pewamo and Hoytville, indicate the reduction of iron oxides. This reduction is commonly accompanied by some transfer of iron, either local or general. Yellowish-red, yellowish-brown, or brown mottles and concretions in the deeper horizons of many soils indicate the segregation of iron. After it has been reduced the iron may be removed completely from the horizon, or even from the profile, but in the soils of Allen County, it is more commonly moved only a short distance within the original horizon or into a nearby horizon.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see their relationships, and understand their behavior and their response to their whole environment. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Two systems of classifying soils above the series level have been used in the United States in recent years. The older system was adopted in 1938 (*3*) and revised later (*7*). The system currently used by the National Cooperative Soil Survey was adopted in 1965 and is under continual study. Readers interested in the development of the system should refer to the latest literature available (*4, 9*).

The current system consists of six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are measurable and observable, but the properties are selected so that soils of similar genesis are grouped together. Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

New soil series must be established and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program across the country. After completion of this soil survey, the Berrien soil series was made inactive. Soils named as the Berrien series in this county will be named as the Brems series in later surveys. There are no tentative series in the county.

Table 8 shows the classification of the soil series of Allen County according to both the 1938 system and the current system. The categories of the current system are defined briefly in the following paragraphs.

TABLE 8.—*Soil series in Allen County classified into higher categories*

Series	Current System			Great soil group of 1938 system
	Family	Subgroup	Order	
Belmore	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Berrien	Sandy, mixed, mesic	Aquic Udipsamments	Entisols	Regosols.
Blount	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Low-Humic Gley soils.
Bono	Fine, illitic, noncalcareous, mesic	Typic Haplaquolls	Mollisols	Humic Gley soils.
Brookston	Fine-loamy, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
Carlisle			Histosols	Organic soils.
Chelsea	Sandy, mixed, mesic	Alfic Udipsamments	Entisols	Gray-Brown Podzolic soils.
Crosby	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Low-Humic Gley soils.
Del Rey	Fine, illitic, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Low-Humic Gley soils.
Eel	Fine-loamy, mixed, mesic	Aquic Fluventic Eutrochrepts.	Inceptisols	Alluvial soils.
Fox	Fine-loamy over sandy or sandy skeletal, mixed, mesic.	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Genesee	Fine-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols	Alluvial soils.
Sandy variant	Coarse-loamy, siliceous, nonacid, mesic.	Fluventic Eutrochrepts	Inceptisols	Alluvial soils.
Gilford	Coarse-loamy, mixed, noncalcareous, mesic.	Typic Haplaquolls	Mollisols	Humic Gley soils.
Haskins	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Low-Humic Gley soils.
Hoytville	Fine, illitic, mesic	Mollic Haplaquepts	Inceptisols	Humic Gley soils.
Lenawee	Fine-loamy, mixed, nonacid, mesic	Mollic Haplaquepts	Inceptisols	Humic Gley soils.
Linwood			Histosols	Organic soils.
Martinsville	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Mermill	Fine-loamy, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
Miami	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Montgomery	Fine, mixed, noncalcareous, mesic	Typic Haplaquolls	Mollisols	Humic Gley soils.
Morley	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Nappanee	Fine, illitic, mesic	Typic Ochraqualfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Low-Humic Gley soils.
Oshtemo	Coarse-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Pewamo	Fine, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
Plainfield	Sandy, mixed, mesic	Typic Udipsamments	Entisols	Regosols.
Rawson	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Rensselaer	Fine-loamy, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
St. Clair	Fine, illitic, mesic	Typic Hapludalfs	Alfisols	Gray-Brown Podzolic soils.
Shoals	Fine-loamy, mixed, nonacid, mesic.	Aeric Fluventic Haplaquepts.	Inceptisols	Alluvial soils.
Tawas			Histosols	Organic soils.
Wallkill	Fine-loamy, mixed, nonacid, mesic.	Thapto-Histic Haplaquepts.	Inceptisols	Alluvial soils.
Washtenaw	Fine-loamy, mixed, nonacid, mesic.	Typic Haplaquepts	Inceptisols	Alluvial soils.
Westland	Fine-loamy, mixed, noncalcareous, mesic.	Typic Argiaquolls	Mollisols	Humic Gley soils.
Whitaker	Fine-loamy, mixed, mesic	Aeric Ochraqualfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Low-Humic Gley soils.
Willette			Histosols	Organic soils.

ORDER.—Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system. These are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. Of these, the Entisols, Inceptisols, Mollisols, Alfisols, and Histosols are represented in Allen County.

Entisols are recent soils in which there has been little, if any, horizon development. Inceptisols occur mostly on young, but not recent, land surfaces. Mollisols have a thick, dark-colored surface layer, moderate to strong structure, and base saturation of more than 50 percent. Alfisols contain accumulated aluminum and iron, have argillic or natric horizons, and have a base saturation of more than 35 percent. Histosols are organic soils, but the criteria by which they are to be classified into categories higher than the series are still under consideration.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that indicate genetic similarity. The suborders have a narrower climatic range than the order. The criteria for suborders reflect either the presence or absence of waterlogging, or soil differences resulting from climate or vegetation.

GREAT GROUP.—Each suborder is divided into great groups, on the basis of uniformity in kind and sequence of genetic horizons.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) concept of the group, and other subgroups, called intergrades, having mostly the properties of one great group but also one or more properties of another great group.

FAMILIES.—Families are established within each subgroup, primarily on the basis of properties important to plant growth. Some of these properties are texture, mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

Additional Facts About the County

Allen County is rapidly changing from an essentially rural area to an area of expanding housing and industry. The most rapidly growing area is outside Fort Wayne. The chief centers of industry are in or near Fort Wayne and New Haven, from both of which large, nationally known companies ship products all over the world. Grain, dairy products, and livestock are also processed and marketed within the county.

Providing transportation and access to markets, both within and outside the county, are airplanes, buslines, five railroads, four Federal highways, one interstate highway, and six State highways. There are numerous excellent county roads, many of which are blacktopped.

Physiography, Relief, and Drainage

Allen County is in the Eastern lake section and the Till Plains section of the Central Lowland physiographic province. The southern and western parts are within the Tipton till plain, and the northern and eastern parts are within the Northern lake and moraine region. The Northern lake and moraine region is made up of the Maumee lacustrine plain and the Steuben morainal-lake area (*12*).

Relief ranges from level to rolling or strongly sloping. There are numerous depressions, and some are extensive. The largest area of level relief is in the eastern part of the county, in the area once occupied by glacial Lake Maumee. Smaller but still fairly extensive level areas are in the southwestern and northwestern parts of the county. In the northern and south-central parts of the county and in the southwestern corner, the relief ranges from nearly level to rolling or strongly sloping but is most commonly gently undulating. These areas and the areas along streams and drainageways are more strongly dissected than other areas. The most strongly dissected areas are in the north-central part of the county, along Cedar Creek in Perry Township and along the St. Joseph River in Cedar Creek Township. The highest elevation in the county is in Perry Township.

The divide between the Lake Erie watershed and the Mississippi River watershed passes through the county several miles east of Fort Wayne (see fig. 14, p. 69). Water from most of the county drains into the Maumee River, which is part of the Lake Erie watershed. The Maumee River is formed by the confluence of the St. Marys River, which drains much of the southern part of the county, and the St. Joseph River, which drains much of the northern part of the county. The far western one-fourth of the county is drained by the Little River and the Eel River, both of which are part of the Mississippi River watershed. The valley of the Little River is also called the Wabash sluiceway.

Water Supply

Water to supply the cities of Fort Wayne and New Haven is taken from the St. Joseph River. At present, an average of 20.36 million gallons a day is pumped from the reservoir near Cedarville. There is no indication of a water shortage. The river is fed mainly from surface runoff and at high water carries large amounts of silt. Otherwise, pollution is kept to a minimum.

Woodburn, Monroeville, and Grabill have public water systems that utilize ground water. Rural towns, farms, some suburban developments, and certain industrial facilities also depend on ground water. Slightly more than half the ground water used is pumped from wells that are completely within the glacial drift. None of these wells has the capacity to supply an extremely large amount of water, but they supply enough to meet domestic and light agricultural needs. Industries and the municipalities are generally supplied from wells drilled into the limestone bedrock. These wells are 100 to 400 feet deep, and they produce as much as 500 gallons a minute.

Climate[6]

The climate of Allen County is characterized by wide variations in temperature from summer to winter and fairly uniform distribution of precipitation throughout the year. Day-to-day changes in temperature and relative humidity are less pronounced in summer than in the other

[6] Prepared by LAWRENCE A. SCHOAL, State climatologist, U.S. Weather Bureau.

seasons. Table 9 shows selected weather data from the U.S. Weather Bureau Station at Baer Field in Fort Wayne. These data are representative of the entire county. Local variations can be accounted for by differences in elevation, aspect, air drainage, ground cover, soil wetness, and distance from a large body of water.

TABLE 9.—*Selected weather data for Fort Wayne, Indiana*

[Data from Weather Bureau Station at Baer Field; elevation 791 feet. Abstracted from Local Climatological Data, Annual Summary With Comparative Data, 1967, Fort Wayne, Indiana]

Month	Temperature				Degree days [1]	Precipitation			Average total snowfall	Wind		Average number of days				
	Average daily maximum	Average daily minimum	Record highest	Record lowest		Average total	Maximum	Minimum		Average speed	Prevailing direction	Clear	Partly cloudy	Cloudy	90° F. and above	32° F. and below
	°F.	°F.	°F.	°F.		In.	In.	In.	In.	Miles/hr.						
January	34. 4	19. 6	61	−18	1, 178	2. 67	9. 72	0. 39	6. 6	11. 4	W	4	7	20	0	17
February	36. 1	20. 4	59	−18	1, 028	2. 24	4. 43	. 42	7. 3	11. 4	W	5	7	16	0	13
March	45. 0	27. 6	79	−10	890	2. 78	5. 29	. 81	5. 6	12. 2	W	4	8	19	0	5
April	59. 0	39. 6	87	18	471	3. 14	7. 11	1. 28	1. 7	12. 1	SW	5	8	17	0	0
May	71. 0	50. 4	91	27	189	3. 73	6. 85	1. 21	(2)	10. 7	SW	7	10	14	1	0
June	80. 5	60. 6	94	39	39	4. 17	8. 29	1. 15	0	9. 0	SW	6	12	12	5	0
July	85. 1	63. 2	96	44	0	3. 37	6. 34	2. 02	0	8. 0	SW	8	13	10	4	0
August	83. 2	61. 7	101	38	9	3. 04	5. 61	1. 26	0	7. 6	SW	9	13	9	4	0
September	75. 8	53. 8	94	32	105	2. 67	5. 23	1. 04	0	8. 6	SW	10	10	10	1	0
October	64. 0	42. 0	89	23	378	2. 86	9. 26	. 14	. 1	9. 2	SW	11	8	12	0	0
November	47. 0	30. 7	76	10	783	2. 55	5. 28	. 90	3. 3	11. 3	W	6	6	18	0	2
December	35. 5	21. 3	63	−10	1, 135	2. 09	5. 45	. 42	5. 7	11. 2	W	5	6	20	0	14
Year	59. 7	40. 9	101	−18	6, 205	35. 31	9. 72	. 14	30. 3	10. 2	SW	80	108	177	15	50

[1] Based on a temperature of 65° F. and computed from average monthly temperatures. These data show relative heating requirements for dwellings. Degree days for a single day are obtained by subtracting the average temperature of the day from 65°.

[2] Trace.

Precipitation averages a little more than 35 inches a year. The smallest amount of rainfall in any year during the period of record was 24.40 inches, and the largest was 51.78. Figure 15, page 74, shows the probable frequency of rainfall of specified intensities and durations. For example, it shows that 2 inches of rain in 1 hour can be expected once in 25 years, 1.8 inches in 2 hours can be expected once in 5 years, and 0.1 inch of rain an hour for a period of 24 hours can be expected once in 2 years.

Droughts are most likely in midsummer, when showers are scattered, general rains infrequent, and evaporation losses high. A drought severe enough to reduce crop yields drastically has never occurred in Allen County.

Degree days range from a normal of 1,178 in January to a normal of 0 in July. The value for each day is obtained by subtracting the mean temperature for that day from 65° F.

The average length of the growing season is about 156 days. The average date of the last freezing temperature (32°) in spring is about May 7, and the average date of the first freezing temperature in fall is about October 10.

Thunderstorms occur on about 43 days each year. A few can be expected to be accompanied by winds strong enough to damage property. Since 1916 there have been 15 tornadoes in Allen County, but they did little damage.

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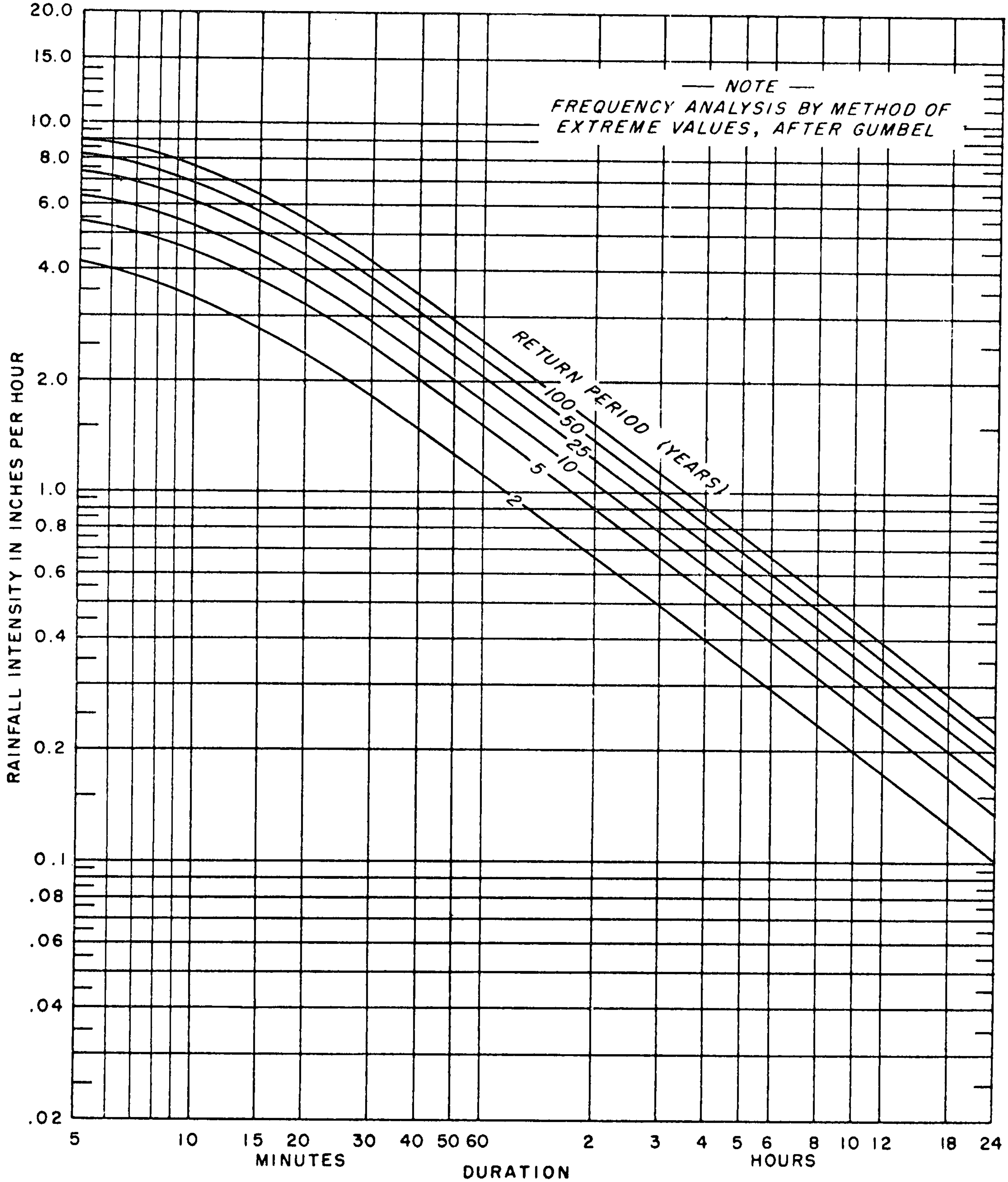

Figure 15.—Frequency of rainfall of specified intensities and durations at Fort Wayne for the period 1911–51.

Glossary

Acidity. See Reaction, soil.

Aggregate, soil. Many fine particles held in a single mass or cluster, such as a clod, crumb, block, or prism.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available moisture capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in a soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Catch crop. A quick-growing crop, planted and harvested between two regular crops in consecutive seasons, or between two patches of regular crops in the same season. Also called an intercrop.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a wire when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material; tends to stretch somewhat and pull apart, rather than pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting, and harvesting in rows that are at right angles to the natural direction of the slope or parallel to the terrace grade.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and thus to protect areas downslope from the effects of such runoff.

Erosion. The wearing away of the land surface by wind, running water, and other geologic agents.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Internal soil drainage. The downward movement of water through the soil profile. The rate of movement is determined by the texture, structure, and other characteristics of the soil profile and underlying layers, and by the height of the water table, either permanent or perched. Terms for expressing internal drainage are *none, very slow, slow, medium, rapid,* and *very rapid.*

Leached soil. A soil from which most of the soluble materials have been removed or in which these have been moved from one part of the profile to another.

Loess. A fine-grained eolian deposit consisting dominantly of silt-sized particles.

Mapping unit. Areas of soil of the same kind, outlined on the soil map and identified by a symbol.

Meadow. A field in which biennial or perennial crops are grown for hay. In this soil survey, the terms "meadow," "meadow crops," and "hay" are used interchangeably.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Natural drainage. Drainage that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time. If podzolic, they commonly have mottling below a depth of 6 to 16 inches in the lower part of the A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods; they are light gray and generally mottled from the surface downward, but some have few or no mottles.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Nutrient, plant. Any element taken in by a plant, essential to its growth and used by it in the production of food and tissue. Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements are nutrients obtained from the soil. Carbon, hydrogen, and oxygen are nutrients obtained largely from the air and water.

Parent material (soil). The disintegrated and partly weathered rock from which a soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality that enables a soil to transmit water or air. Terms used to describe permeability are as follows: *Very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil type, series, or other unit in the soil classification system, made because of differences that affect management but do not affect classification. A soil type, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects management.

Poorly graded. Of soil material, consisting mainly of particles of nearly the same size. Because there is little difference in the size of the particles, the density of a poorly graded soil can be increased only slightly by compaction.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. As a soil separate, individual rock or mineral fragments ranging from 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Slope classes. The slope classes used in this survey are as follows:

	Percent of slope
Level and nearly level	0 to 2 percent
Gently sloping	2 to 6 percent
Moderately sloping	6 to 12 percent
Strongly sloping	12 to 18 percent
Steep	18 to 25 percent
Very steep	25 to 40 percent

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon parent material, as conditioned by relief, over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in a mature soil includes the A and B horizons. Generally, the characteristics of these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. Any layer beneath the solum, or true soil; the C or R horizon.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Type, soil. A subdivision of the soil series, made on the basis of differences in the texture of the surface layer.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Well-graded. Of soil material, consisting of particles that are well distributed over a wide range in size or diameter. The density and bearing properties of a well-graded soil normally can be easily increased by compaction. Contrasts with poorly graded.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Other information is given in tables as follows:

Acreage and extent, table 1, page 6.
Estimated yields, table 2, page 35.
Woodland groups, table 3, page 38.
Shrub suitability groups, table 4, page 39.
Engineering uses of the soils, tables 5, 6, and 7, pages 44 through 67.

Absence of a symbol or number indicates that the mapping unit was not placed in the specified unit or group.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group	Shrub suitability group
			Symbol	Page	Number	Number
BeB	Belmore fine sandy loam, 2 to 6 percent slopes	8	IIIe-13	31	1	4
BhA	Belmore loam, 0 to 2 percent slopes	8	IIs-1	30	1	3
BhB	Belmore loam, 2 to 6 percent slopes	8	IIe-9	29	1	3
BkA	Berrien loamy fine sand, moderately fine substratum, 0 to 2 percent slopes 1/	8	IVs-1	34	6	4
BlA	Blount loam, 0 to 2 percent slopes	9	IIw-2	29	2	2
BmA	Blount silt loam, 0 to 2 percent slopes	9	IIw-2	29	2	2
BmB	Blount silt loam, 2 to 6 percent slopes	9	IIw-2	29	2	2
BmB2	Blount silt loam, 2 to 6 percent slopes, moderately eroded	9	IIw-2	29	2	2
Bn	Bono mucky silty clay	9	IIIw-2	32	4	1
Bo	Bono silty clay	9	IIIw-2	32	4	1
Bp	Borrow pits	9	VIIe-3	34	--	--
Br	Brookston silt loam	10	IIw-1	29	4	1
Bs	Brookston silty clay loam	10	IIw-1	29	4	1
Ca	Carlisle muck	10	IIIw-8	32	9	1
ChB	Chelsea fine sand, 2 to 6 percent slopes	11	IIIs-1	32	7	4
ChC	Chelsea fine sand, 6 to 12 percent slopes	11	IIIe-12	31	7	4
ChD	Chelsea fine sand, 12 to 18 percent slopes	11	IVe-12	33	7	4
CrA	Crosby loam, 0 to 2 percent slopes	11	IIw-2	29	2	2
CsA	Crosby silt loam, 0 to 2 percent slopes	11	IIw-2	29	2	2
CsB	Crosby silt loam, 2 to 6 percent slopes	11	IIw-2	29	2	2
CsB2	Crosby silt loam, 2 to 6 percent slopes, moderately eroded	11	IIw-2	29	2	2
Dr	Del Rey silt loam	12	IIw-2	29	2	2
Ee	Eel loam	12	I-2	28	3	3
Es	Eel silt loam	12	I-2	28	3	3
FmA	Fox loam, 0 to 2 percent slopes	13	IIs-1	30	1	3
FmB	Fox loam, 2 to 6 percent slopes	13	IIe-9	29	1	3
FmC2	Fox loam, 6 to 12 percent slopes, moderately eroded	13	IIIe-9	31	1	3
Ge	Genesee loam	13	I-2	28	3	3
Gh	Genesee silt loam	13	I-2	28	3	3
Gm	Genesee silty clay loam	13	I-2	28	3	3
Gn	Genesee fine sandy loam, sandy variant	13	I-2	28	3	3
Go	Gilford fine sandy loam	14	IIw-4	30	4	1
Gp	Gravel pits	14	------	--	--	--
HaA	Haskins loam, 0 to 2 percent slopes	14	IIw-2	29	2	2
HaB	Haskins loam, 2 to 6 percent slopes	14	IIw-2	29	2	2
HnA	Whitaker fine sandy loam, 0 to 2 percent slopes	26	IIw-2	29	2	2
HoA	Whitaker loam, 0 to 2 percent slopes	26	IIw-2	29	2	2
HoB	Whitaker loam, 2 to 6 percent slopes	26	IIw-2	29	2	2
HpA	Whitaker silt loam, 0 to 2 percent slopes	27	IIw-2	29	2	2
Hs	Hoytville silty clay	15	IIw-1	29	4	1

See footnote at end of Guide.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Capability unit Page	Woodland group Number	Shrub suitability group Number
Le	Lenawee mucky silty clay loam	15	IIw-1	29	4	1
Ls	Lenawee silty clay loam	15	IIw-1	29	4	1
Lw	Linwood muck	16	IIIw-8	32	9	1
Ma	Made land	16	VIIe-3	34	--	--
McA	Martinsville loam, 0 to 2 percent slopes	16	I-1	28	1	3
McB	Martinsville loam, 2 to 6 percent slopes	16	IIe-1	28	1	3
McB2	Martinsville loam, 2 to 6 percent slopes, moderately eroded	16	IIe-1	28	1	3
McC2	Martinsville loam, 6 to 12 percent slopes, moderately eroded	16	IIIe-1	30	1	3
MeA	Martinsville loam, gravelly substratum, 0 to 2 percent slopes	16	I-1	28	1	3
MeB	Martinsville loam, gravelly substratum, 2 to 6 percent slopes	17	IIe-1	28	1	3
MfA	Martinsville silt loam, 0 to 2 percent slopes	17	I-1	28	1	3
MgC3	Martinsville soils, 6 to 12 percent slopes, severely eroded	17	IVe-1	33	1	3
Mh	Mermill complex	17	IIw-1	29	4	1
MkB2	Miami loam, 2 to 6 percent slopes, moderately eroded	18	IIe-1	28	1	3
MlC2	Miami silt loam, 6 to 12 percent slopes, moderately eroded	18	IIIe-1	30	1	3
MmC3	Miami soils, 6 to 12 percent slopes, severely eroded	18	IVe-1	33	1	3
Mn	Montgomery silty clay	18	IIIw-2	32	4	1
Mo	Montgomery silty clay loam	18	IIIw-2	32	4	1
MrB	Morley silt loam, 2 to 6 percent slopes	19	IIe-6	28	1	--
MrB2	Morley silt loam, 2 to 6 percent slopes, moderately eroded	19	IIe-6	28	1	3
MrC	Morley silt loam, 6 to 12 percent slopes	19	IIIe-6	30	1	3
MrC2	Morley silt loam, 6 to 12 percent slopes, moderately eroded	19	IIIe-6	30	1	3
MrD2	Morley silt loam, 12 to 18 percent slopes, moderately eroded	19	IVe-6	33	8	3
MrE2	Morley silt loam, 18 to 25 percent slopes, moderately eroded	19	VIe-1	34	8	3
MsB3	Morley soils, 2 to 6 percent slopes, severely eroded	19	IIIe-6	30	1	3
MsC3	Morley soils, 6 to 12 percent slopes, severely eroded	20	IVe-6	33	8	3
MsD3	Morley soils, 12 to 18 percent slopes, severely eroded	20	VIe-1	34	8	3
MsE3	Morley soils, 18 to 25 percent slopes, severely eroded	20	VIIe-1	34	8	3
Na	Nappanee silt loam	20	IIIw-6	32	2	2
Np	Nappanee silty clay loam	20	IIIw-6	32	2	2
OfA	Oshtemo fine sandy loam, loamy substratum, 0 to 2 percent slopes	21	IIIs-2	33	7	3
OfB	Oshtemo fine sandy loam, loamy substratum, 2 to 6 percent slopes	21	IIIe-13	31	7	3
OfC2	Oshtemo fine sandy loam, loamy substratum, 6 to 12 percent slopes, moderately eroded	21	IIIe-13	31	7	3
OsA	Oshtemo sandy loam, 0 to 2 percent slopes	21	IIIs-2	33	7	3
OsB	Oshtemo sandy loam, 2 to 6 percent slopes	21	IIIe-13	31	7	3
Pc	Pewamo mucky silty clay loam	22	IIw-1	29	4	1
Pe	Pewamo silty clay loam	22	IIw-1	29	4	1
PlB	Plainfield fine sand, moderately fine substratum, 2 to 6 percent slopes	22	IVs-1	34	6	4

GUIDE TO MAPPING UNITS--CONTINUED

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group	Shrub suitability group
			Symbol	Page	Number	Number
PlC	Plainfield fine sand, moderately fine substratum, 6 to 12 percent slopes	22	VIs-1	34	6	4
RaB	Rawson fine sandy loam, 2 to 6 percent slopes	22	IIe-1	28	1	3
RlA	Rawson loam, 0 to 2 percent slopes	23	I-1	28	1	3
RlB2	Rawson loam, 2 to 6 percent slopes, moderately eroded	23	IIe-1	28	1	3
RlC2	Rawson loam, 6 to 12 percent slopes, moderately eroded	23	IIIe-1	30	1	3
Rm	Rensselaer loam	23	IIw-1	29	4	1
Rn	Rensselaer mucky silty clay loam	23	IIw-1	29	4	1
Ro	Rensselaer silt loam	23	IIw-1	29	4	1
Rs	Rensselaer silty clay loam	23	IIw-1	29	4	1
SaB	St. Clair silt loam, 2 to 6 percent slopes	24	IIIe-11	31	8	3
ScB2	St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded	24	IIIe-11	31	8	3
ScC2	St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded	24	IVe-11	33	8	3
Sh	Shoals silty clay loam	24	IIw-7	30	5	1
Ta	Tawas muck	25	IVw-3	34	9	1
Wa	Wallkill silt loam	25	IIw-7	30	9	1
Wc	Wallkill silty clay loam	25	IIw-7	30	9	1
Wh	Washtenaw silt loam	25	IIw-1	29	4	1
Ws	Westland loam	26	IIw-1	29	4	1
Wt	Westland silty clay loam	26	IIw-1	29	4	1
Wu	Willette muck	27	IIIw-8	32	9	1

1/ After completion of this soil survey, the Berrien soil series was made inactive. Soils named as the Berrien series in this county will be named as the Brems series in later surveys.

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All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).

GENERAL SOIL MAP

ALLEN COUNTY, INDIANA

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PURDUE UNIVERSITY AGRICULTURAL
EXPERIMENT STATION

SCALE IN MILES

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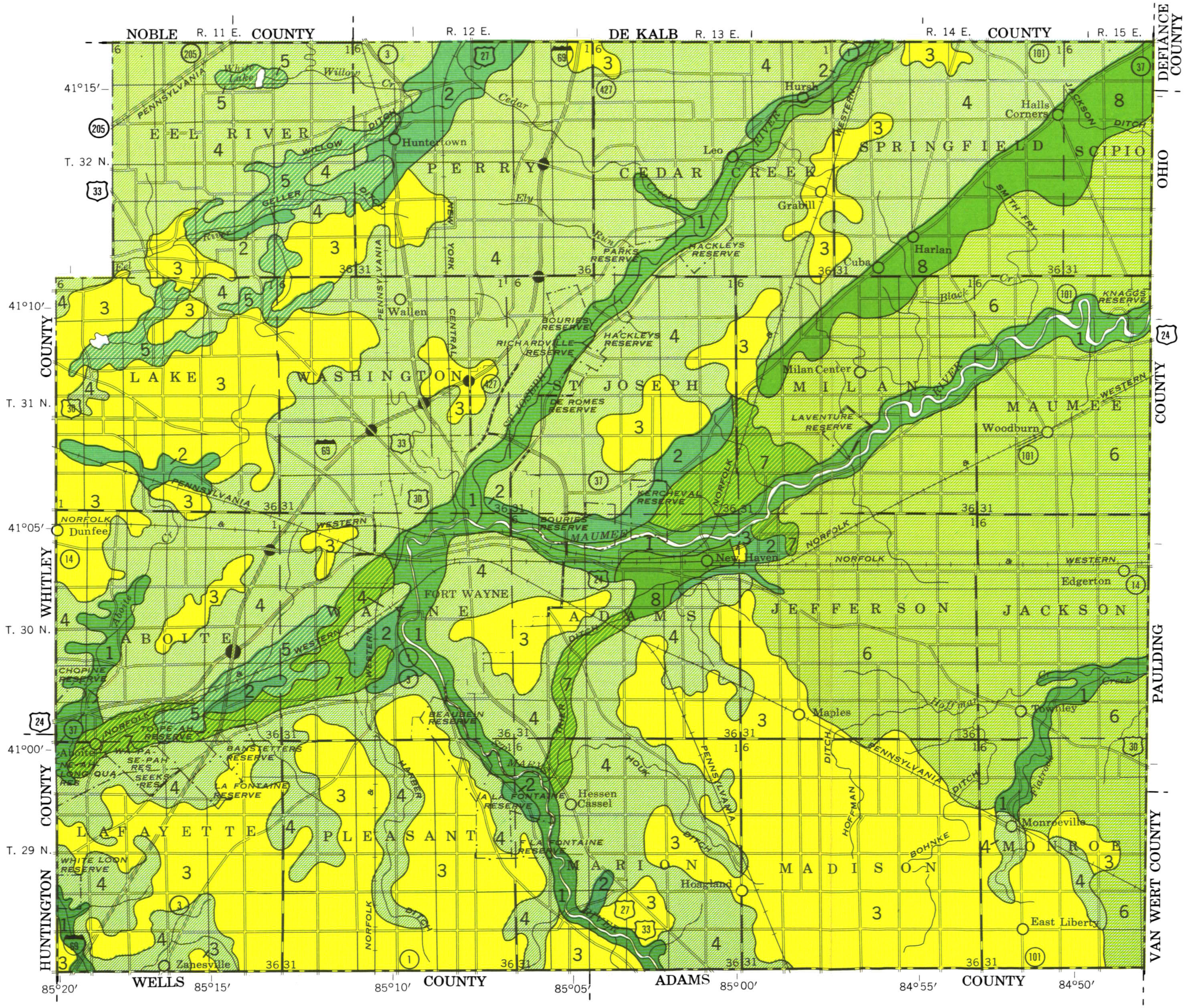


SOIL ASSOCIATIONS

1 — Eel-Martinsville-Genesee association: Deep, well drained and moderately well drained, nearly level to moderately sloping, medium-textured and moderately fine textured soils on bottom lands and stream terraces

2 — Martinsville-Belmore-Fox association: Deep, well-drained, nearly level to moderately sloping, medium-textured and moderately coarse textured soils on stream terraces and beach ridges

3 — Blount-Pewamo association: Deep, somewhat poorly drained to very poorly drained, nearly level and gently sloping, medium-textured and moderately fine textured soils on uplands

4 — Morley-Blount association: Deep, moderately well drained and somewhat poorly drained, nearly level to steep, medium-textured soils on uplands

5 — Carlisle-Willette association: Deep, very poorly drained mucky soils in upland depressions

6 — Hoytville-Nappanee association: Deep, somewhat poorly drained to very poorly drained, nearly level, medium-textured to fine-textured soils on uplands

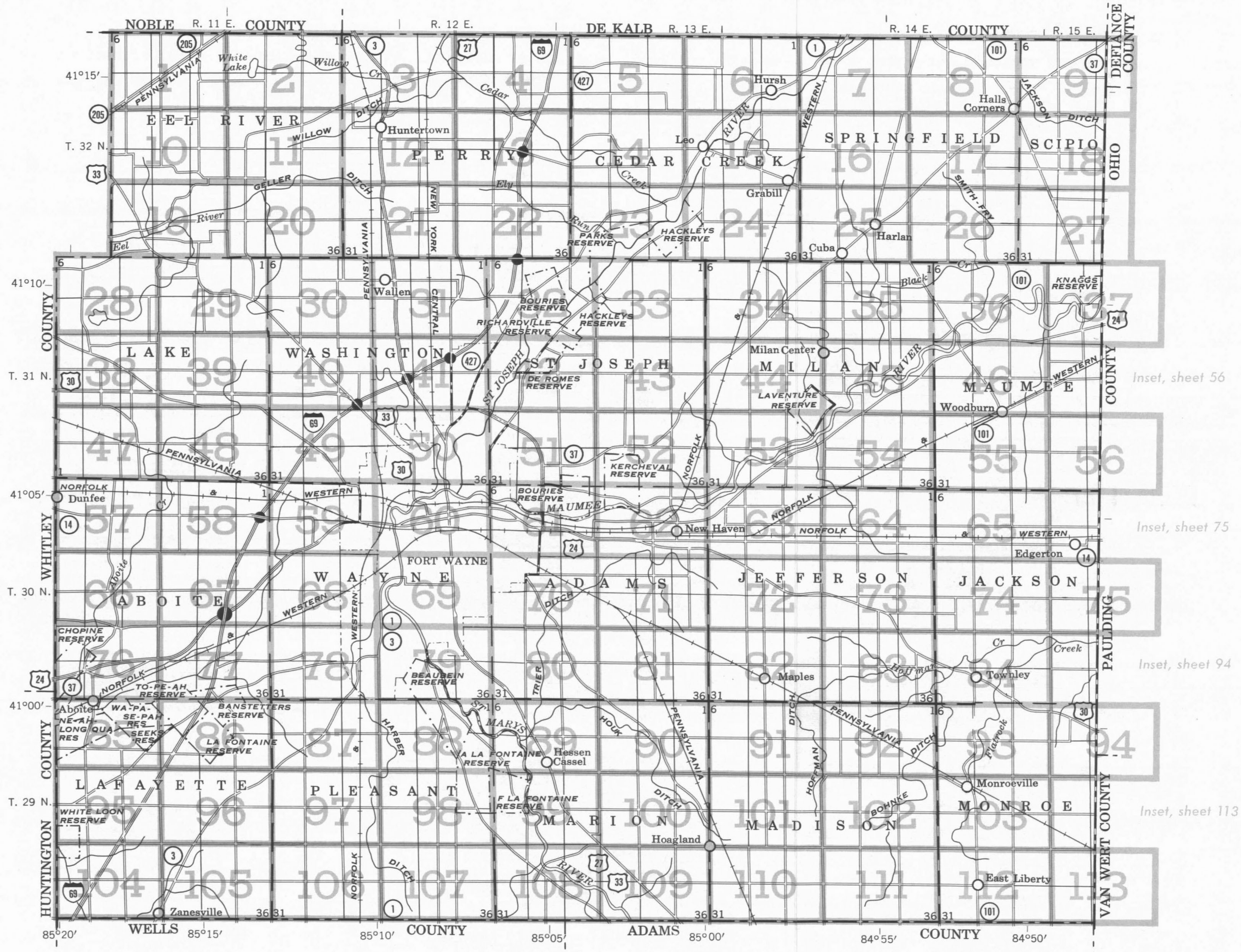
7 — Lenawee-Montgomery-Rensselaer association: Deep, very poorly drained, nearly level, medium-textured to fine-textured soils on uplands, in drainageways, and on stream terraces

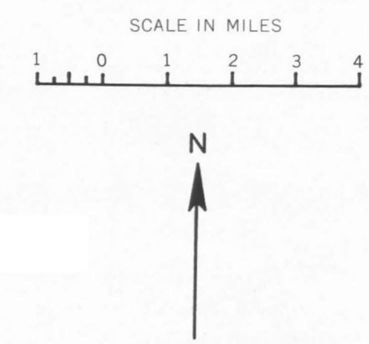
8 — Rensselaer-Whitaker association: Deep, somewhat poorly drained to very poorly drained, nearly level and gently sloping, moderately coarse textured to moderately fine textured soils on uplands and stream terraces

May 1968

INDEX TO MAP SHEETS

ALLEN COUNTY, INDIANA





CONVENTIONAL SIGNS

WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry (FY)
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church
- Station

Mines and Quarries

Mine dump

Pits, gravel or other

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land division corners

DRAINAGE

Streams, double-line
- Perennial
- Intermittent

Streams, single-line
- Perennial
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Unclassified

Canals and ditches (CANAL)

Lakes and ponds
- Perennial (water, w)
- Intermittent

Wells, water (flowing)

Spring

Marsh or swamp

Wet spot

Alluvial fan

Drainage end

RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol (Dx)
- Gravel
- Stony, very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

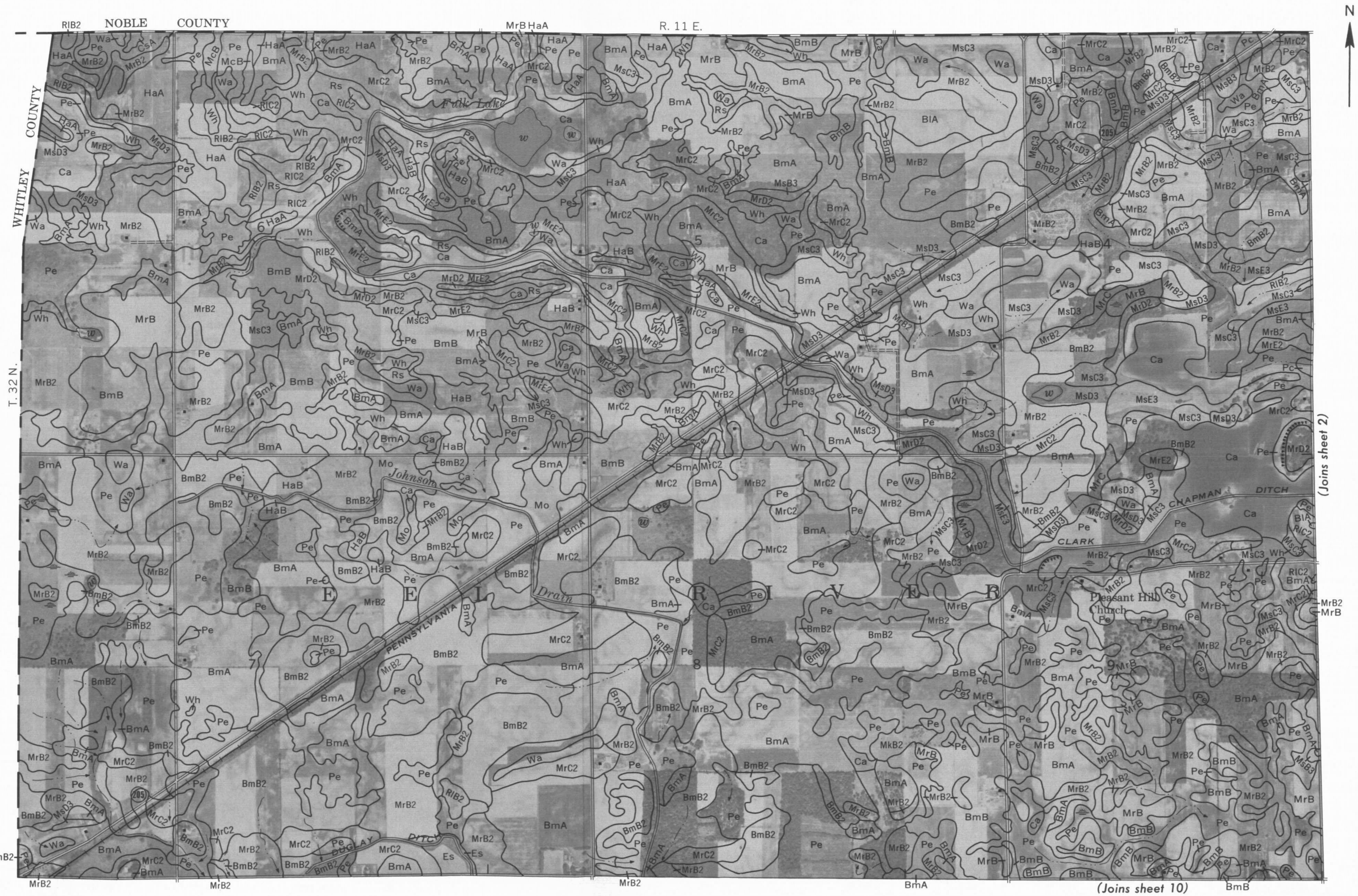
SOIL LEGEND

The first capital letter is the initial one of the soil name. [1] A second capital letter, A, B, C, D, or E, shows the slope. Symbols without a slope letter are for nearly level soils or land types. A final number, 2 or 3, in the symbol, shows that the soil is moderately or severely eroded.

SYMBOL	NAME
BeB	Belmore fine sandy loam, 2 to 6 percent slopes
BhA	Belmore loam, 0 to 2 percent slopes
BhB	Belmore loam, 2 to 6 percent slopes
BkA	Berrien loamy fine sand, moderately fine substratum, 0 to 2 percent slopes
BlA	Blount loam, 0 to 2 percent slopes
BmA	Blount silt loam, 0 to 2 percent slopes
BmB	Blount silt loam, 2 to 6 percent slopes
BmB2	Blount silt loam, 2 to 6 percent slopes, moderately eroded
Bn	Bono mucky silty clay
Bo	Bono silty clay
Bp	Borrow pits
Br	Brookston silt loam
Bs	Brookston silty clay loam
Ca	Carlisle muck
ChB	Chelsea fine sand, 2 to 6 percent slopes
ChC	Chelsea fine sand, 6 to 12 percent slopes
ChD	Chelsea fine sand, 12 to 18 percent slopes
CrA	Crosby loam, 0 to 2 percent slopes
CsA	Crosby silt loam, 0 to 2 percent slopes
CsB	Crosby silt loam, 2 to 6 percent slopes
CsB2	Crosby silt loam, 2 to 6 percent slopes, moderately eroded
Dr	Del Rey silt loam
Ee	Eel loam
Es	Eel silt loam
FmA	Fox loam, 0 to 2 percent slopes
FmB	Fox loam, 2 to 6 percent slopes
FmC2	Fox loam, 6 to 12 percent slopes, moderately eroded
Ge	Genesee loam
Gh	Genesee silt loam
Gm	Genesee silty clay loam
Gn	Genesee fine sandy loam, sandy variant
Go	Gilford fine sandy loam
Gp	Gravel pits
HaA	Haskins loam, 0 to 2 percent slopes
HaB	Haskins loam, 2 to 6 percent slopes
HnA	Whitaker fine sandy loam, 0 to 2 percent slopes
HoA	Whitaker loam, 0 to 2 percent slopes
HoB	Whitaker loam, 2 to 6 percent slopes
HpA	Whitaker silt loam, 0 to 2 percent slopes
Hs	Hoytville silty clay
Le	Lenawee mucky silty clay loam
Ls	Lenawee silty clay loam
Lw	Linwood muck
Ma	Made land
McA	Martinsville loam, 0 to 2 percent slopes
McB	Martinsville loam, 2 to 6 percent slopes
McB2	Martinsville loam, 2 to 6 percent slopes, moderately eroded
McC2	Martinsville loam, 6 to 12 percent slopes, moderately eroded
MeA	Martinsville loam, gravelly substratum, 0 to 2 percent slopes
MeB	Martinsville loam, gravelly substratum, 2 to 6 percent slopes
MfA	Martinsville silt loam, 0 to 2 percent slopes
MgC3	Martinsville soils, 6 to 12 percent slopes, severely eroded
Mh	Mermill complex
MkB2	Miami loam, 2 to 6 percent slopes, moderately eroded
MlC2	Miami silt loam, 6 to 12 percent slopes, moderately eroded
MmC3	Miami soils, 6 to 12 percent slopes, severely eroded
Mn	Montgomery silty clay
Mo	Montgomery silty clay loam
MrB	Morley silt loam, 2 to 6 percent slopes
MrB2	Morley silt loam, 2 to 6 percent slopes, moderately eroded
MrC	Morley silt loam, 6 to 12 percent slopes
MrC2	Morley silt loam, 6 to 12 percent slopes, moderately eroded
MrD2	Morley silt loam, 12 to 18 percent slopes, moderately eroded
MrE2	Morley silt loam, 18 to 25 percent slopes, moderately eroded
MsB3	Morley soils, 2 to 6 percent slopes, severely eroded
MsC3	Morley soils, 6 to 12 percent slopes, severely eroded
MsD3	Morley soils, 12 to 18 percent slopes, severely eroded
MsE3	Morley soils, 18 to 25 percent slopes, severely eroded
Na	Nappanee silt loam
Np	Nappanee silty clay loam
OfA	Oshtemo fine sandy loam, loamy substratum, 0 to 2 percent slopes
OfB	Oshtemo fine sandy loam, loamy substratum, 2 to 6 percent slopes
OfC2	Oshtemo fine sandy loam, loamy substratum, 6 to 12 percent slopes, moderately eroded
OsA	Oshtemo sandy loam, 0 to 2 percent slopes
OsB	Oshtemo sandy loam, 2 to 6 percent slopes
Pc	Pewamo mucky silty clay loam
Pe	Pewamo silty clay loam
PlB	Plainfield fine sand, moderately fine substratum, 2 to 6 percent slopes
PlC	Plainfield fine sand, moderately fine substratum, 6 to 12 percent slopes
RaB	Rawson fine sandy loam, 2 to 6 percent slopes
RlA	Rawson loam, 0 to 2 percent slopes
RlB2	Rawson loam, 2 to 6 percent slopes, moderately eroded
RlC2	Rawson loam, 6 to 12 percent slopes, moderately eroded
Rm	Rensselaer loam
Rn	Rensselaer mucky silty clay loam
Ro	Rensselaer silt loam
Rs	Rensselaer silty clay loam
SaB	St. Clair silt loam, 2 to 6 percent slopes
ScB2	St. Clair silty clay loam, 2 to 6 percent slopes, moderately eroded
ScC2	St. Clair silty clay loam, 6 to 12 percent slopes, moderately eroded
Sh	Shoals silty clay loam
Ta	Tawas muck
Wa	Wallkill silt loam
Wc	Wallkill silty clay loam
Wh	Washtenaw silt loam
Ws	Westland loam
Wt	Westland silty clay loam
Wu	Willette muck

1 Exceptions are symbols for soils in the Whitaker series, which begin with capital letter H.

Soil map constructed 1967 by Cartographic Division, Soil Conservation Service, USDA, from 1964 aerial photographs. Controlled mosaic based on Indiana plane coordinate system, east zone, transverse Mercator projection, 1927 North American datum.



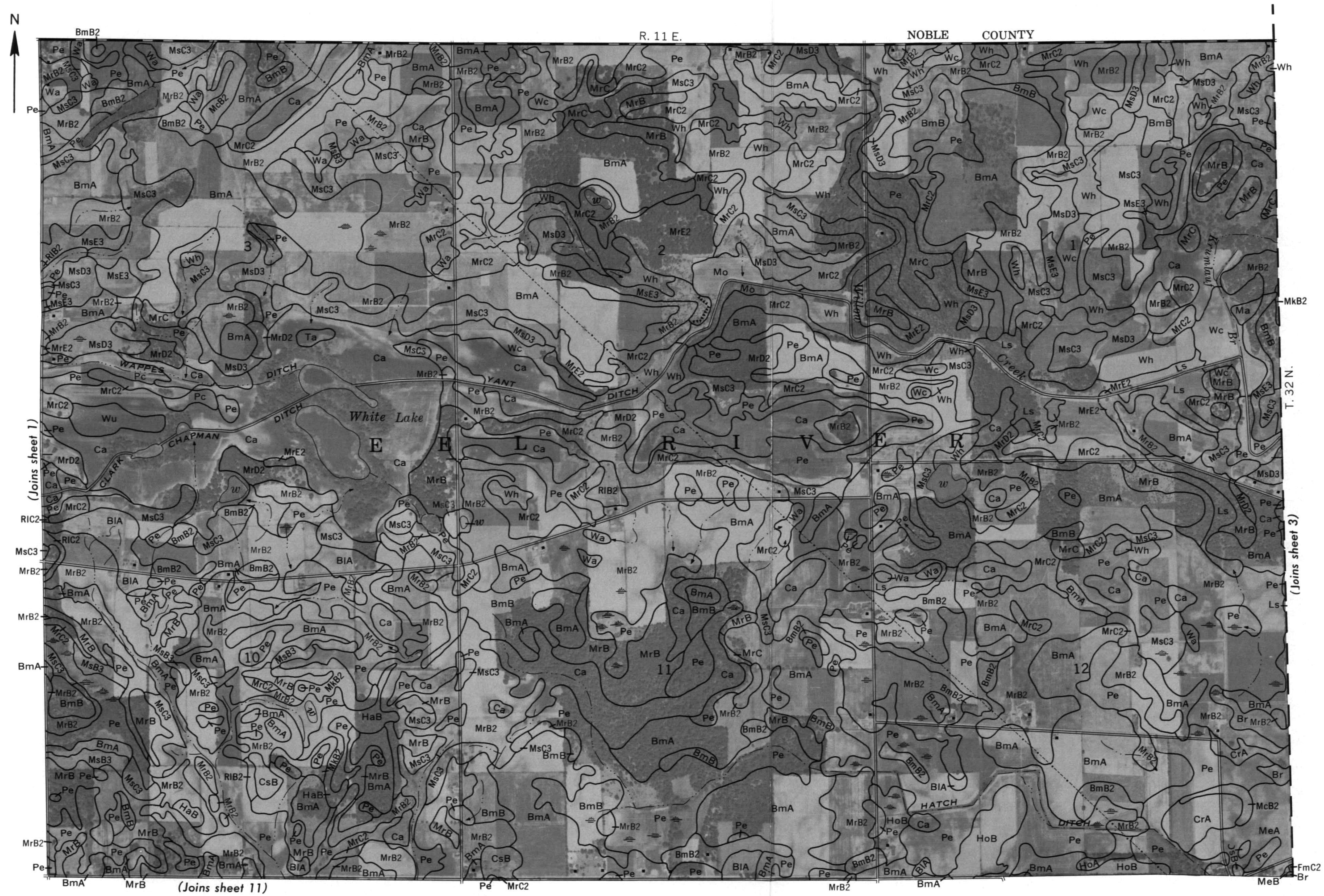
0 ½ Mile Scale 1:15 840 0 3000 Feet

ALLEN COUNTY, INDIANA NO. 1

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

②

ALLEN COUNTY, INDIANA — SHEET NUMBER 2



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ALLEN COUNTY, INDIANA NO. 2

0 ½ Mile Scale 1:15 840 0 3000 Feet

ALLEN COUNTY, INDIANA NO. 3

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
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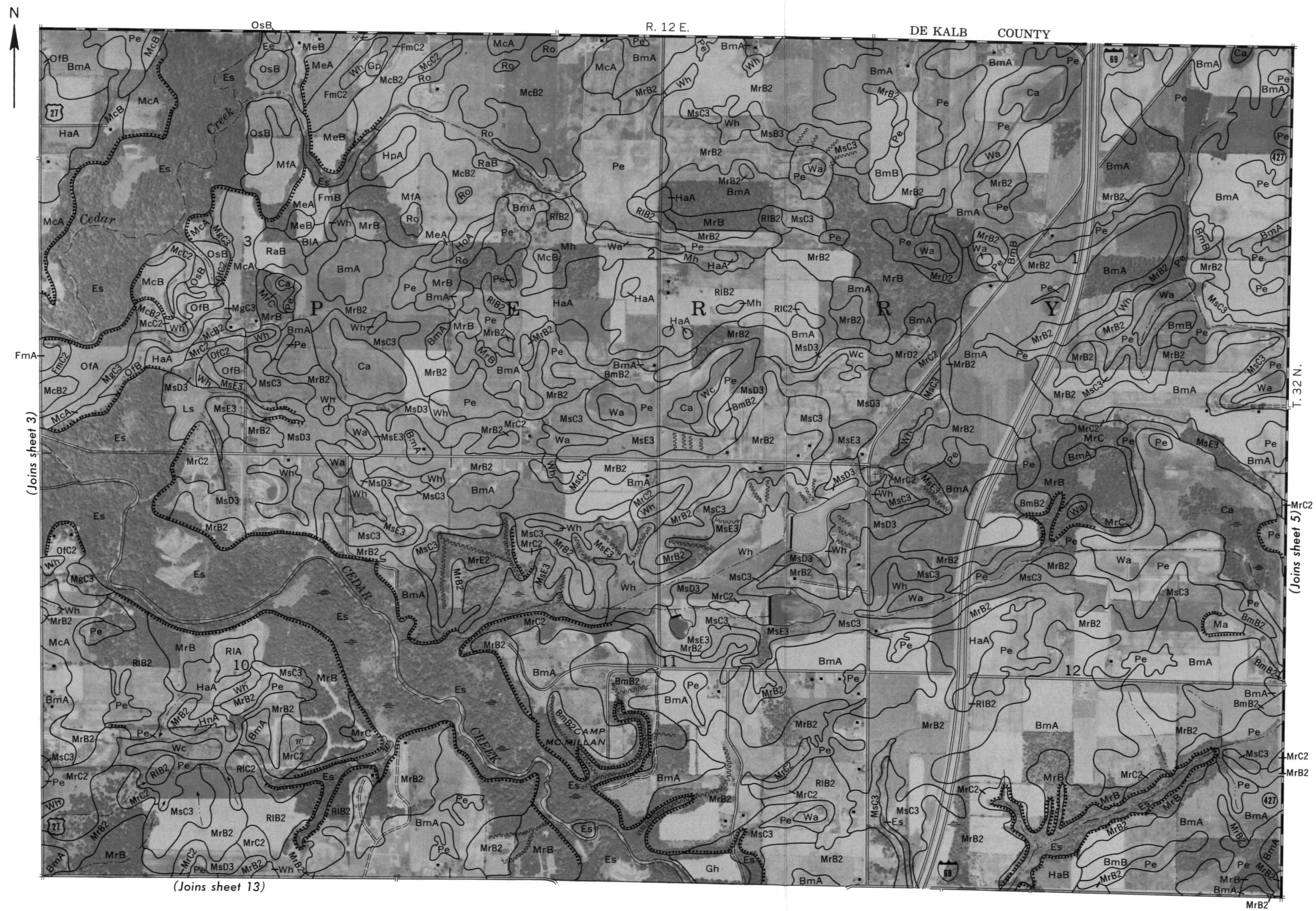
ALLEN COUNTY, INDIANA — SHEET NUMBER 4



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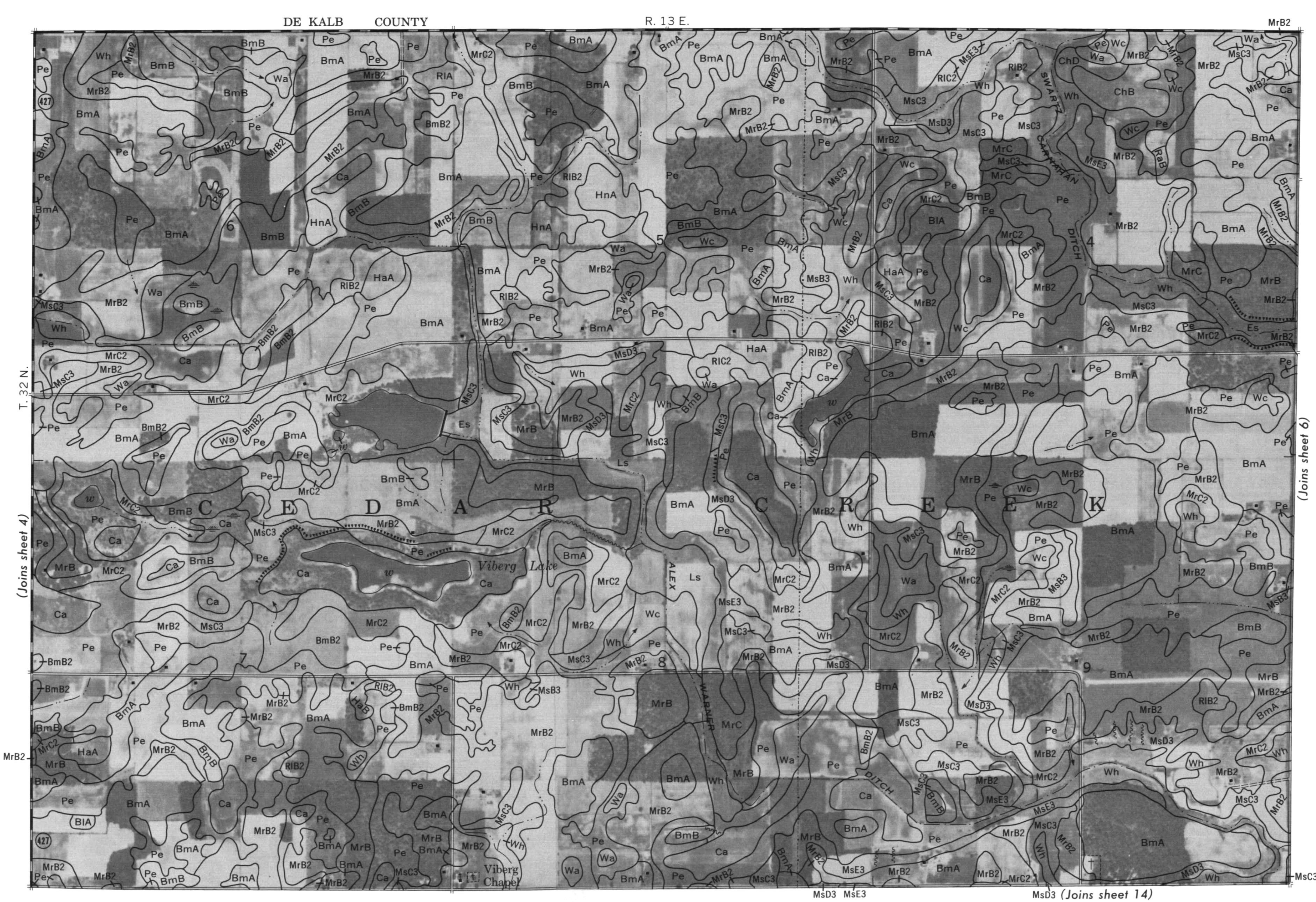
ALLEN COUNTY, INDIANA NO. 5



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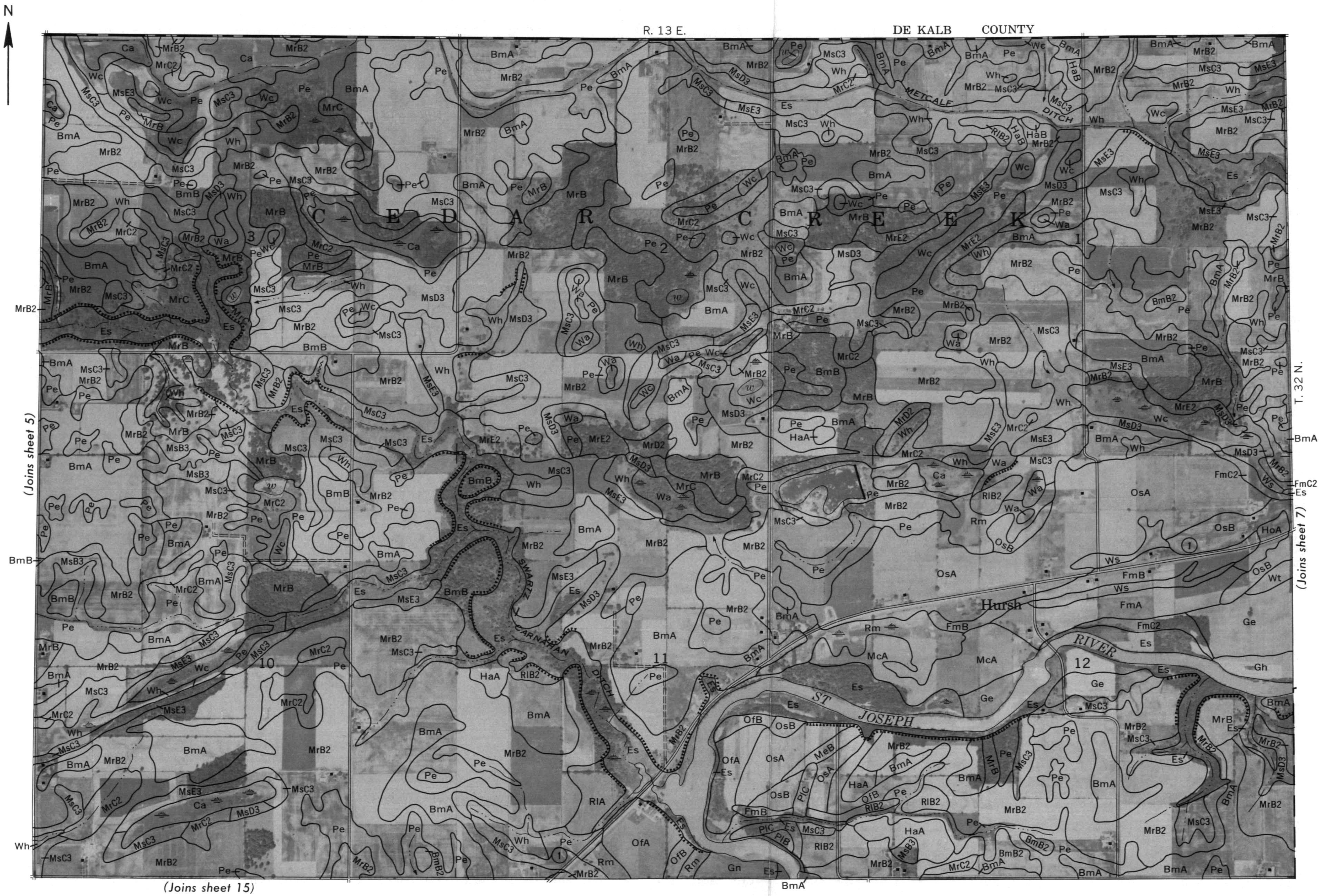

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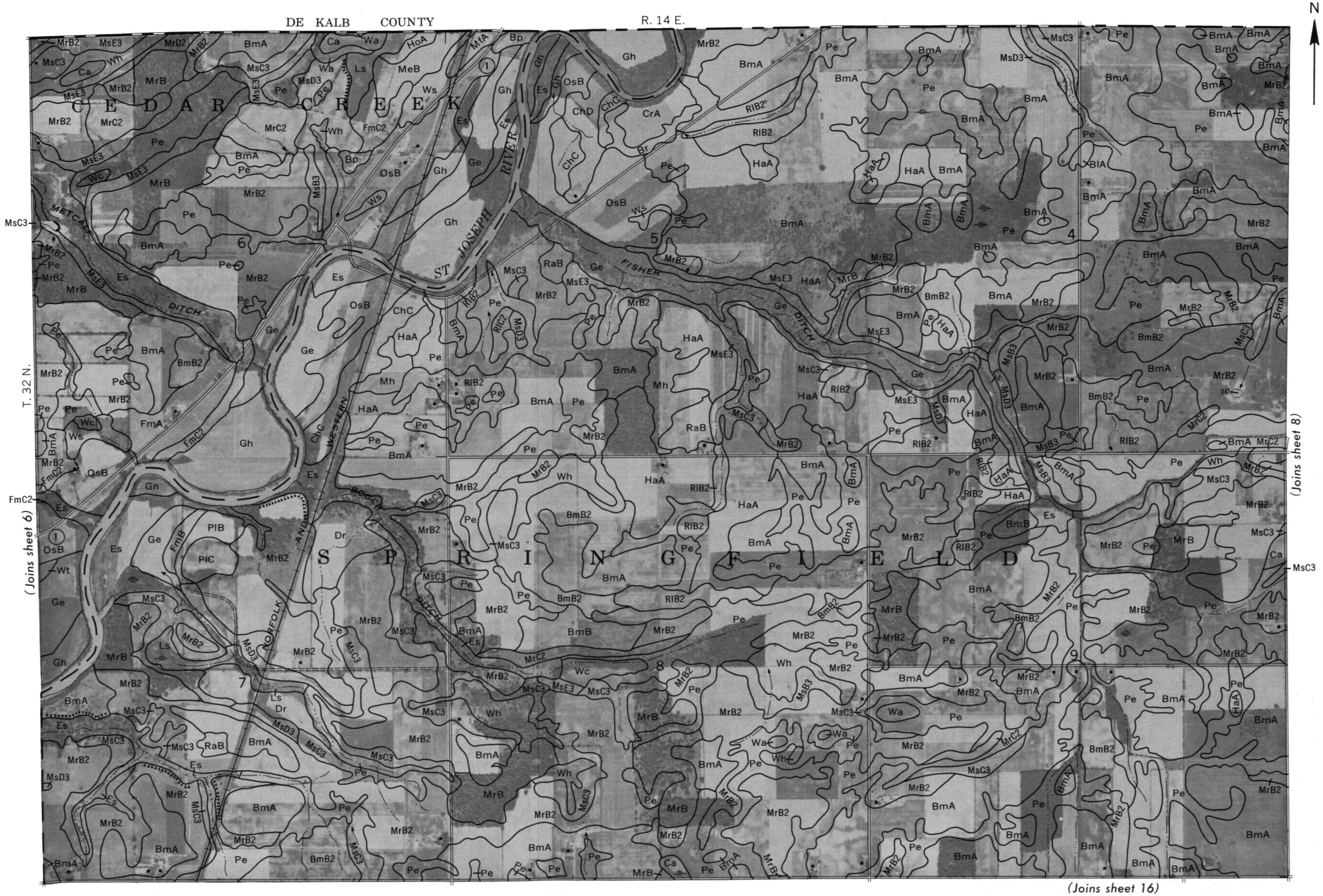

0 ½ Mile Scale 1:15 840 0 3000 Feet

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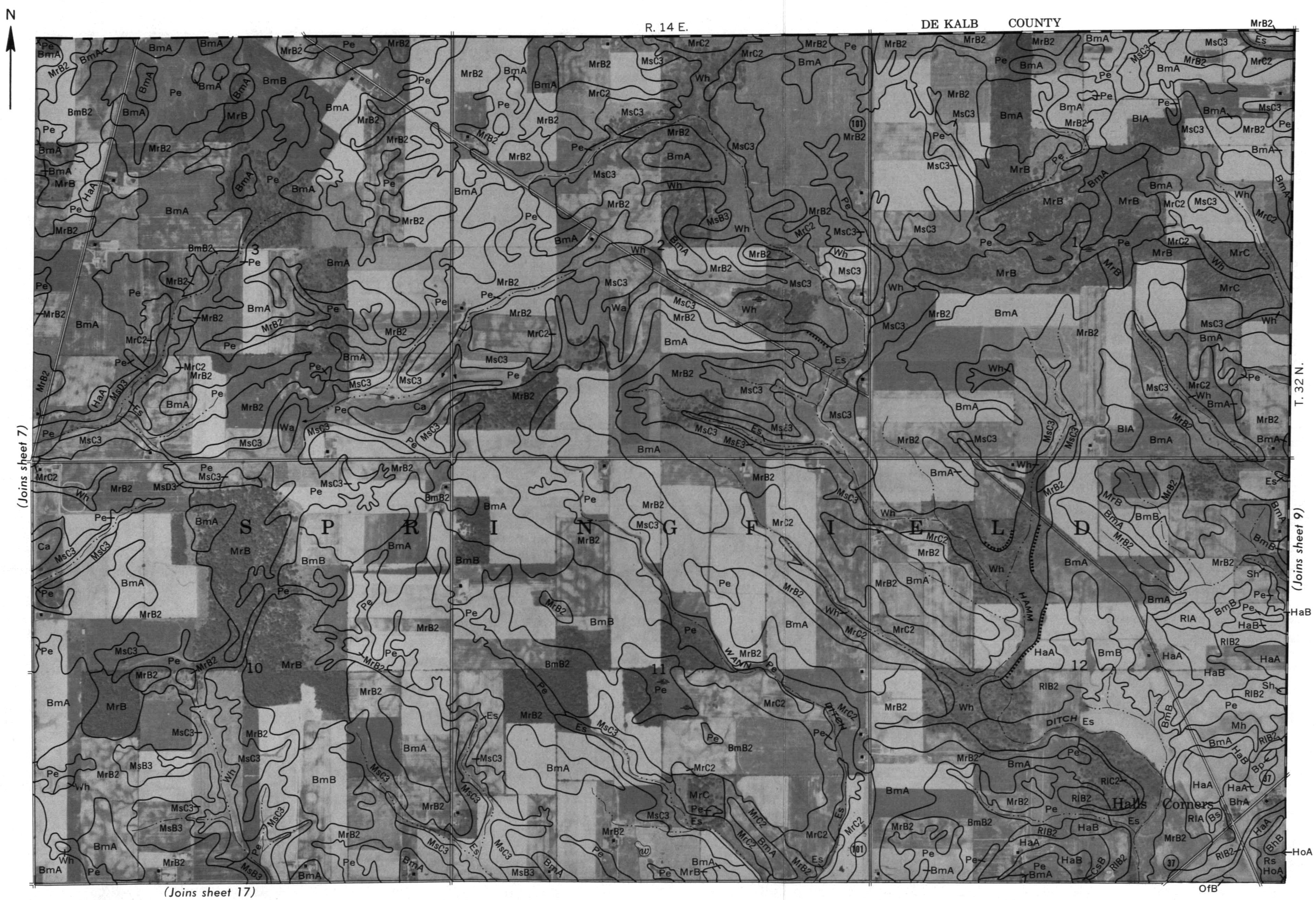
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA — SHEET NUMBER 8



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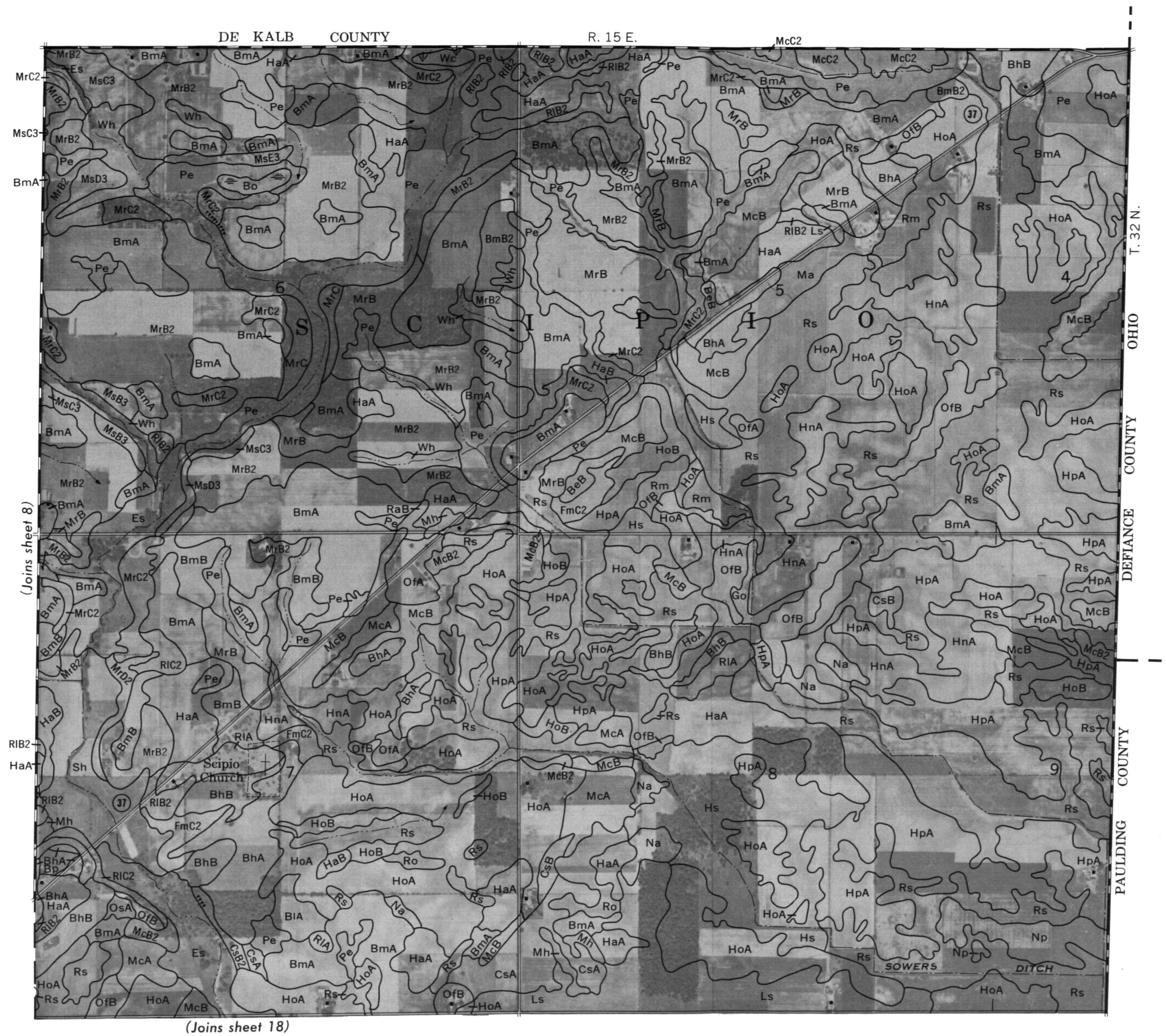
ALLEN COUNTY, INDIANA NO. 9



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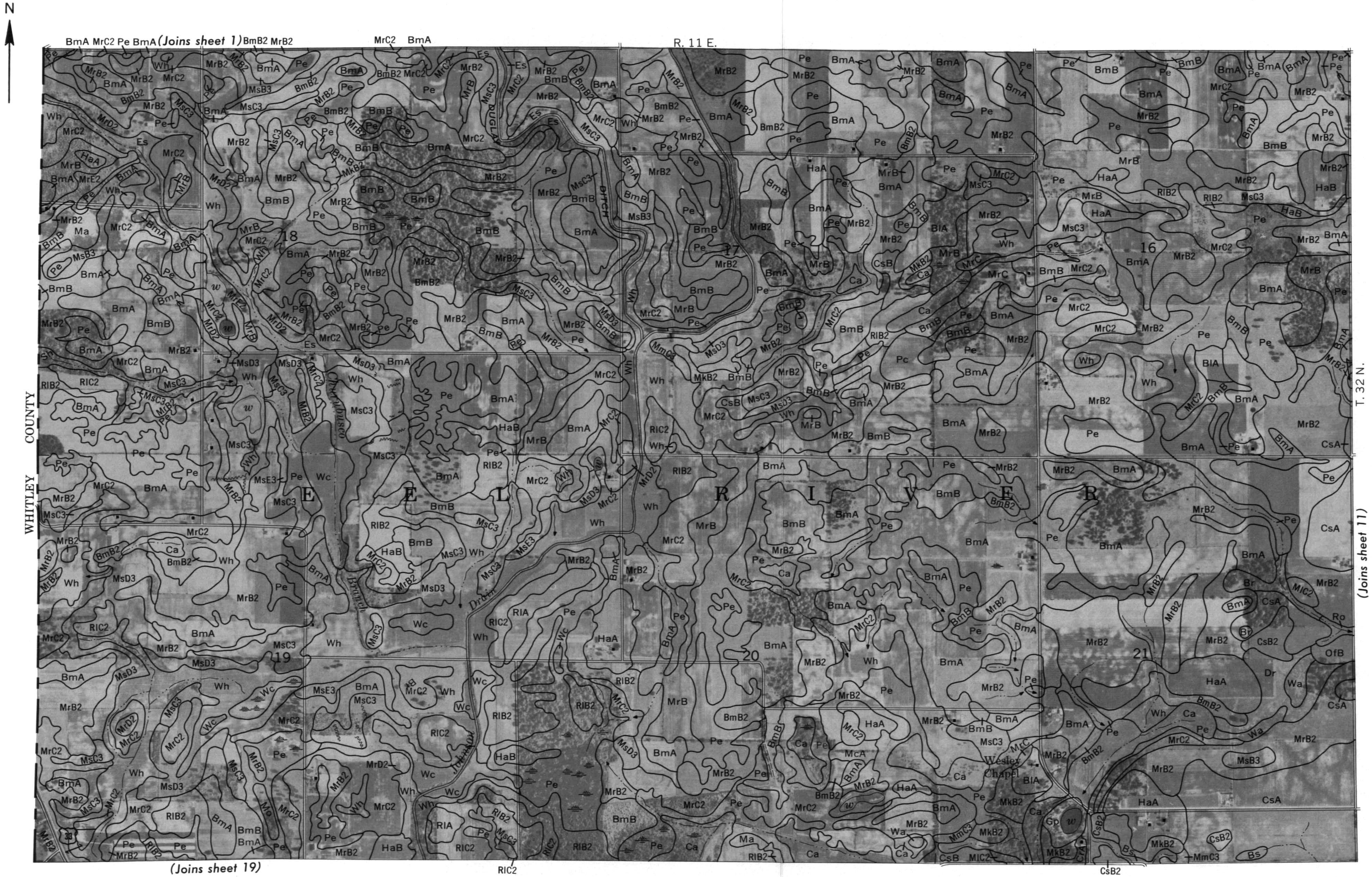

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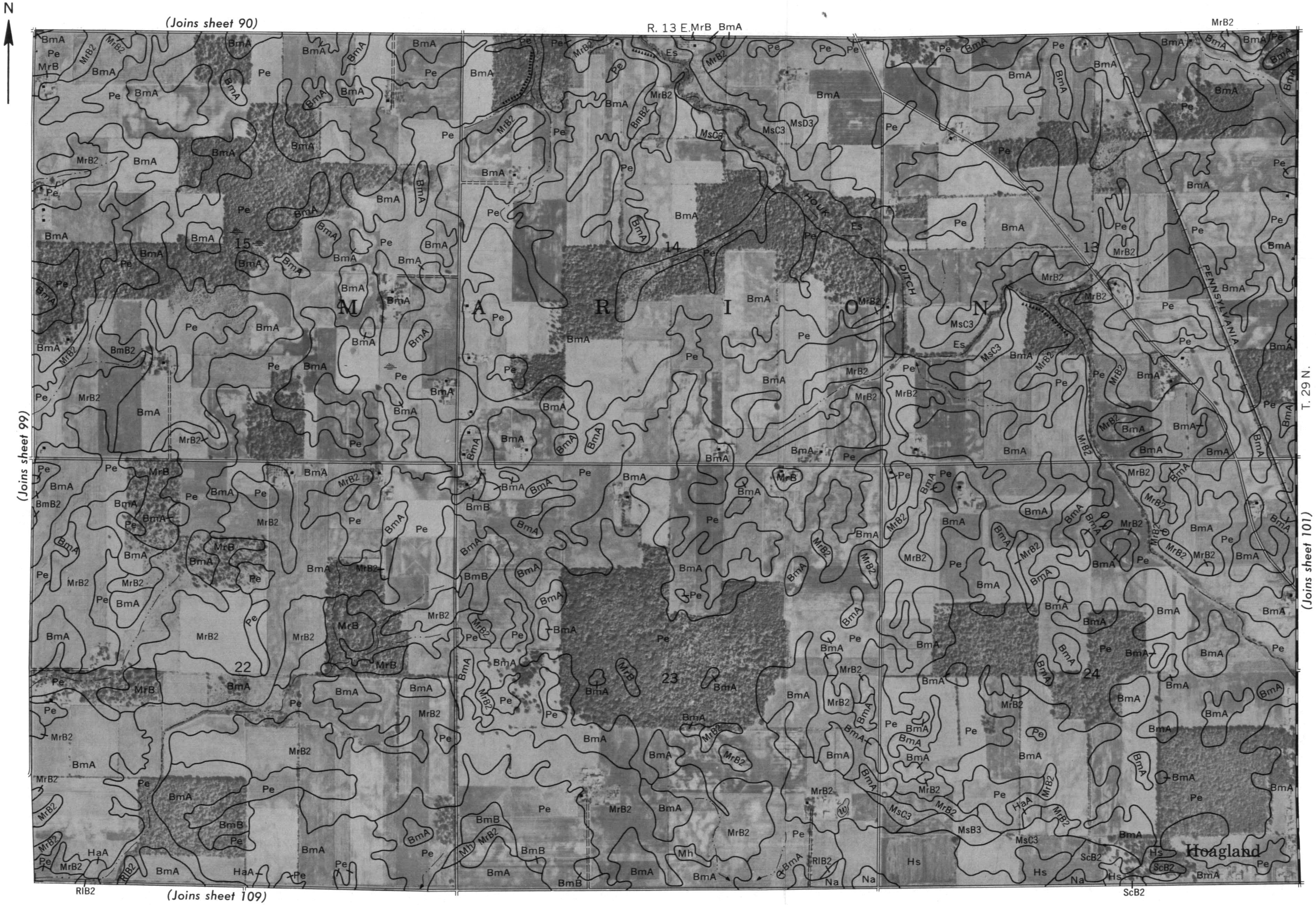

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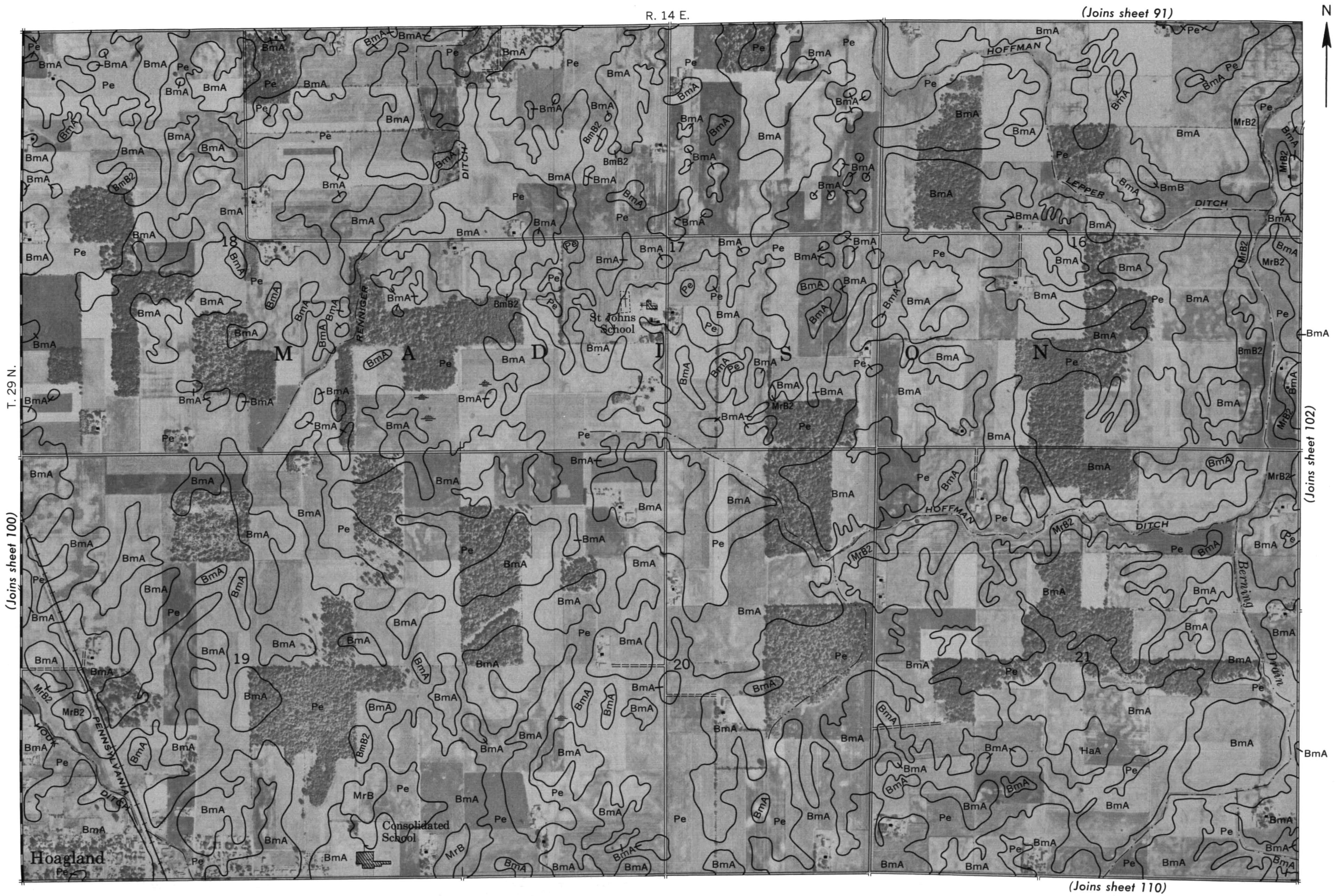

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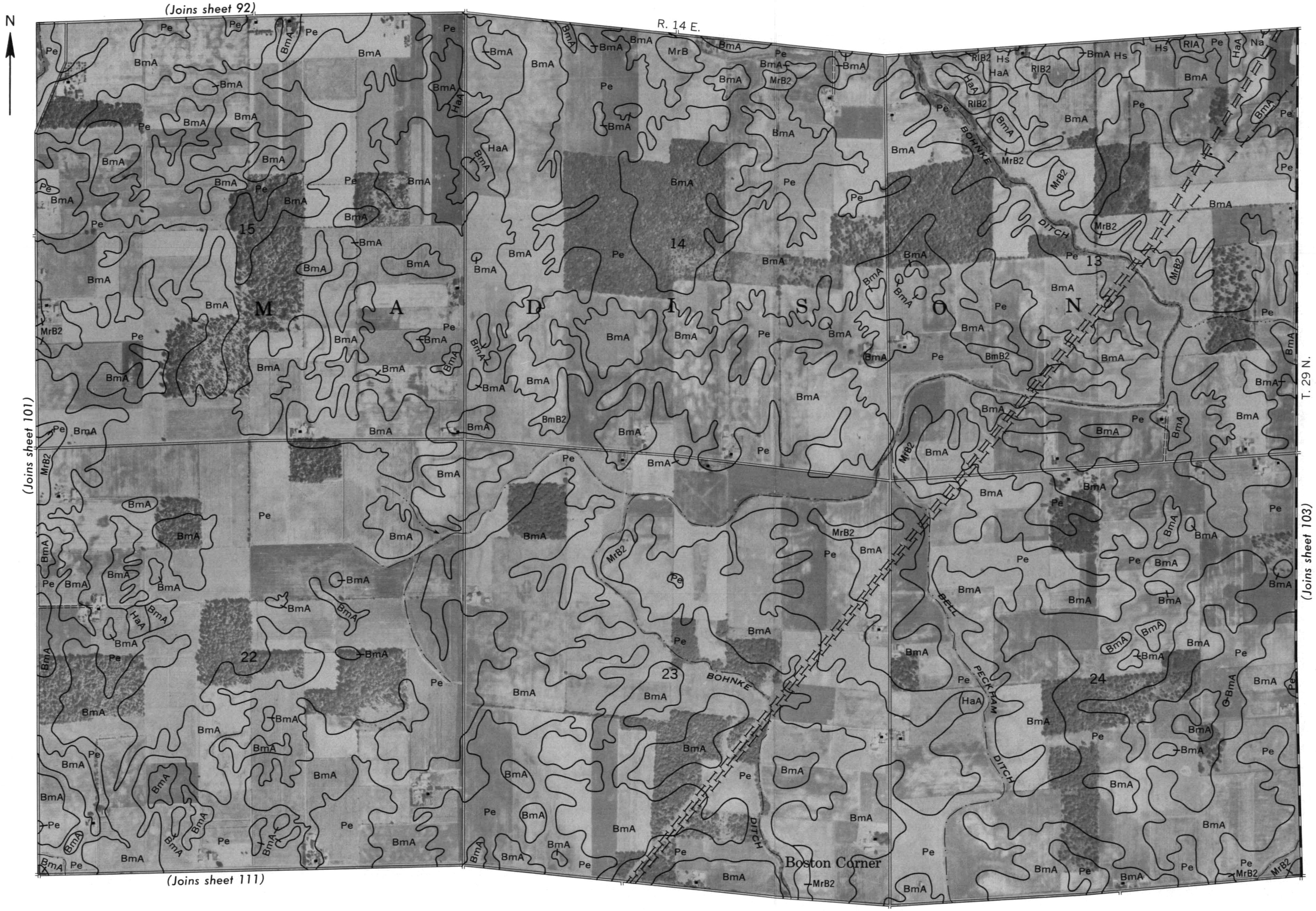
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO.101



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0 ½ Mile Scale 1:15 840 0 3000 Feet

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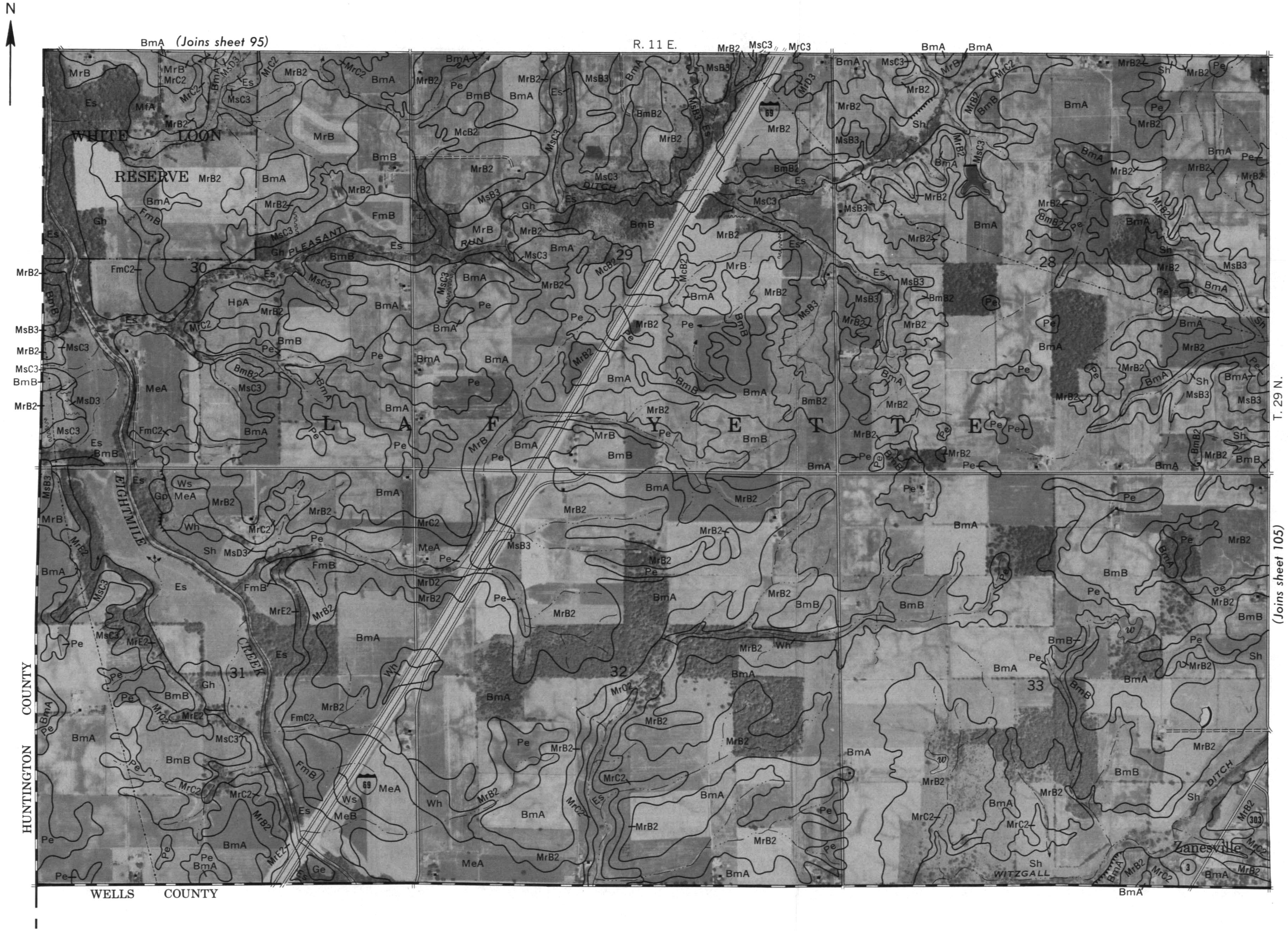
Land division corners are approximately positioned on this map.



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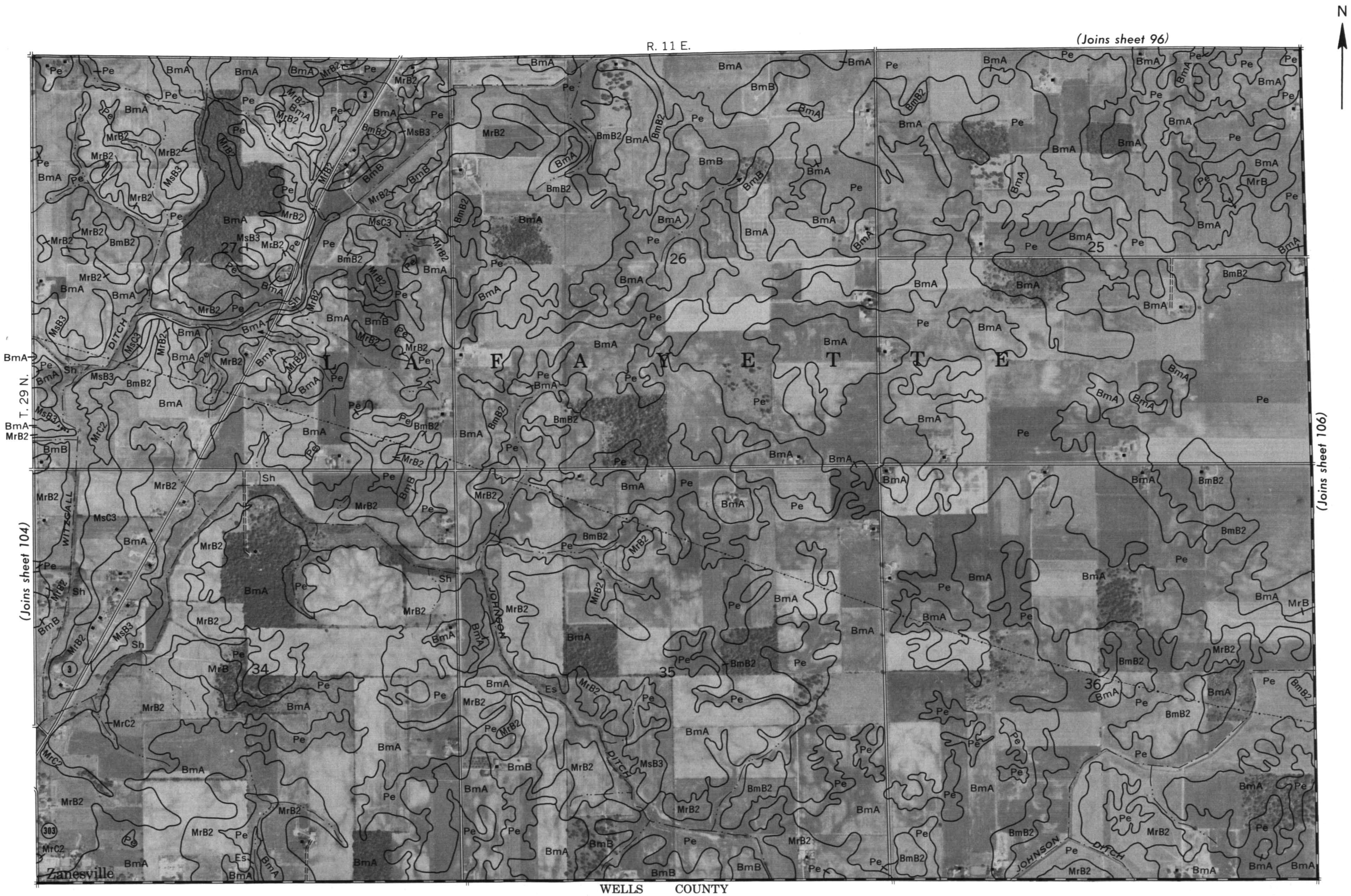


This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO.105

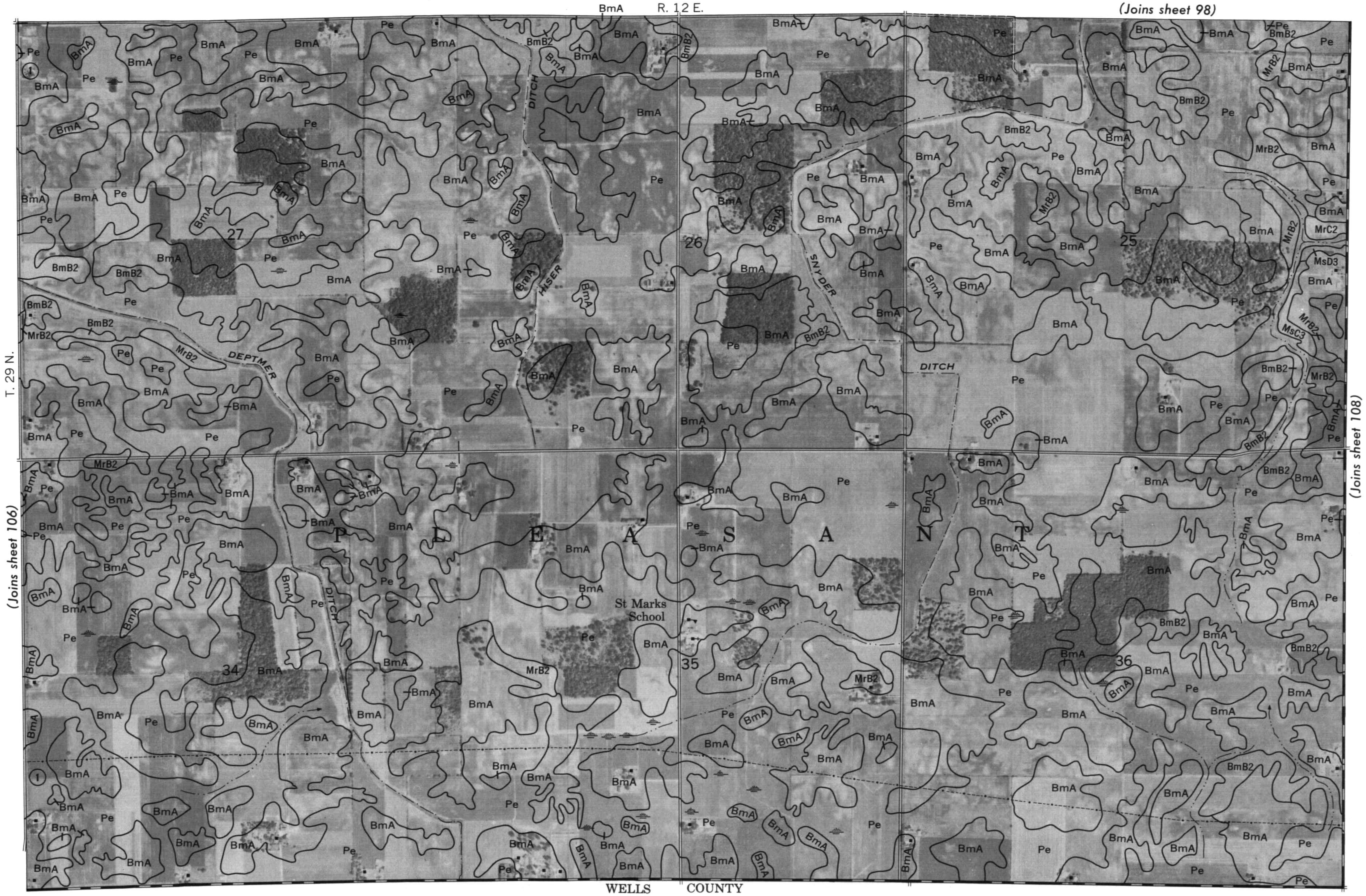
0 ½ Mile Scale 1:15 840 0 3000 Feet

ALLEN COUNTY, INDIANA — SHEET NUMBER 106

N

0 ½ Mile Scale 1:15 840 0 3000 Feet

N



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This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

0 ½ Mile Scale 1:15 840 0 3000 Feet

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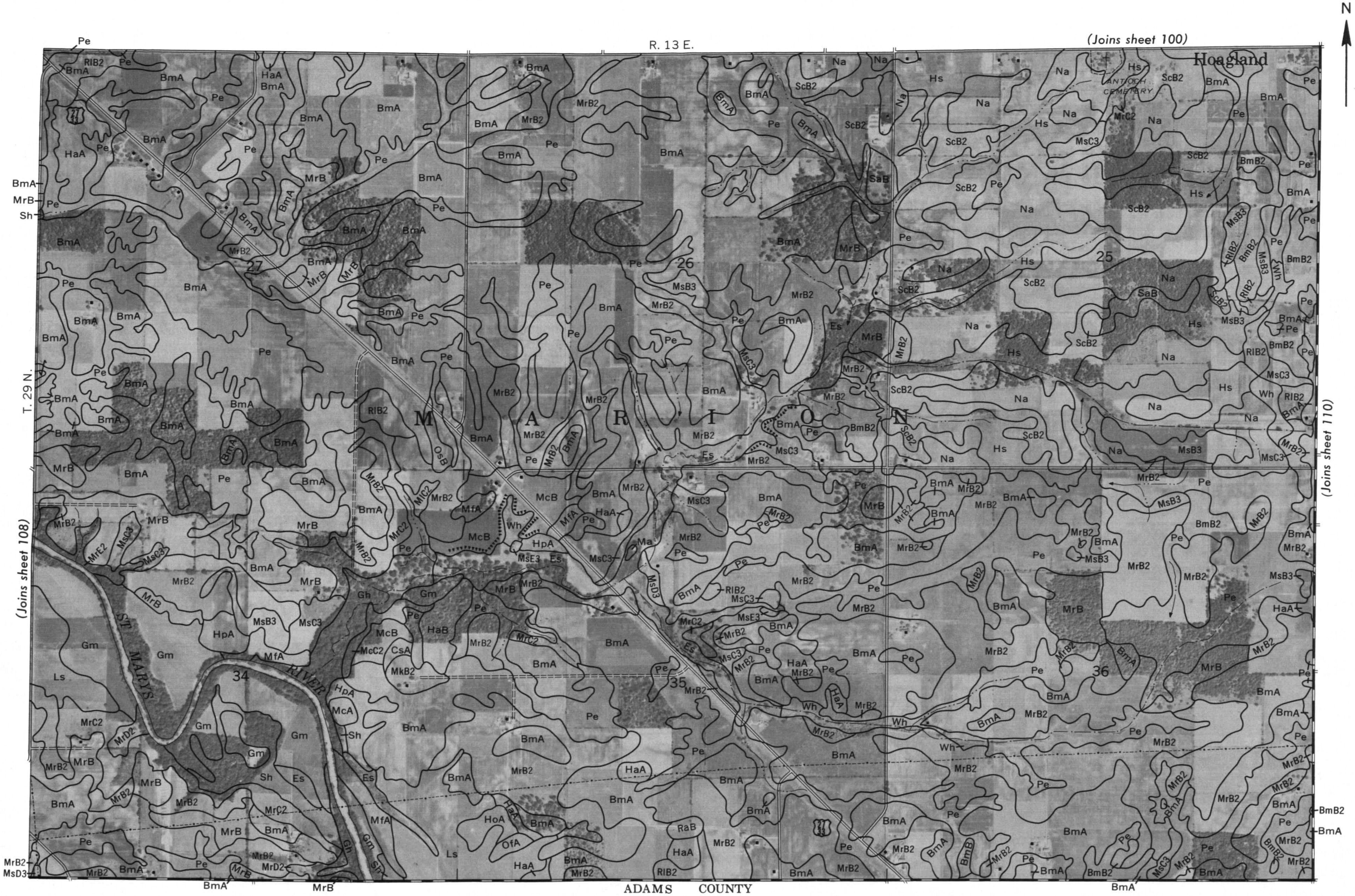
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 109



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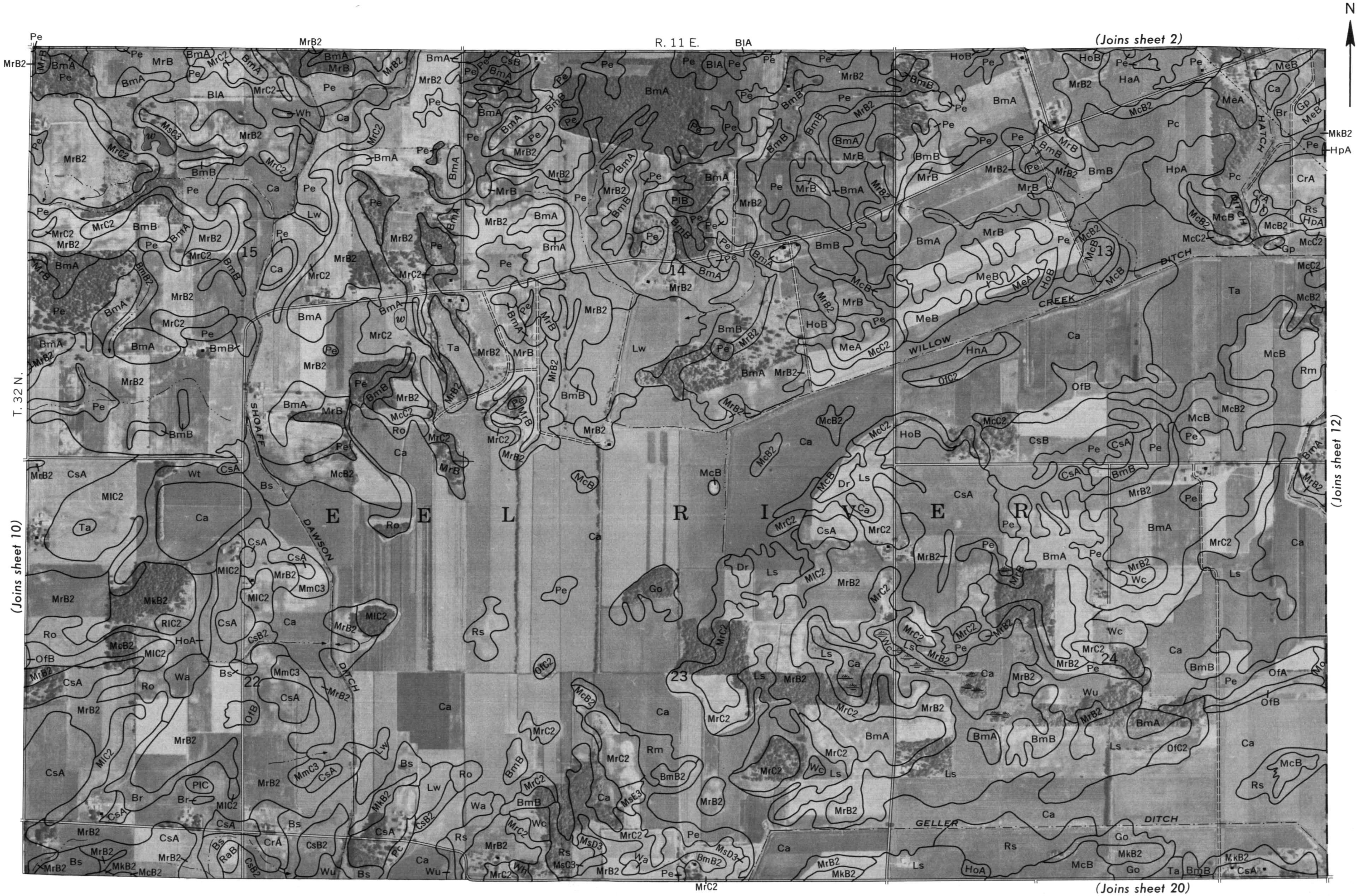

0 ½ Mile Scale 1:15 840 0 3000 Feet

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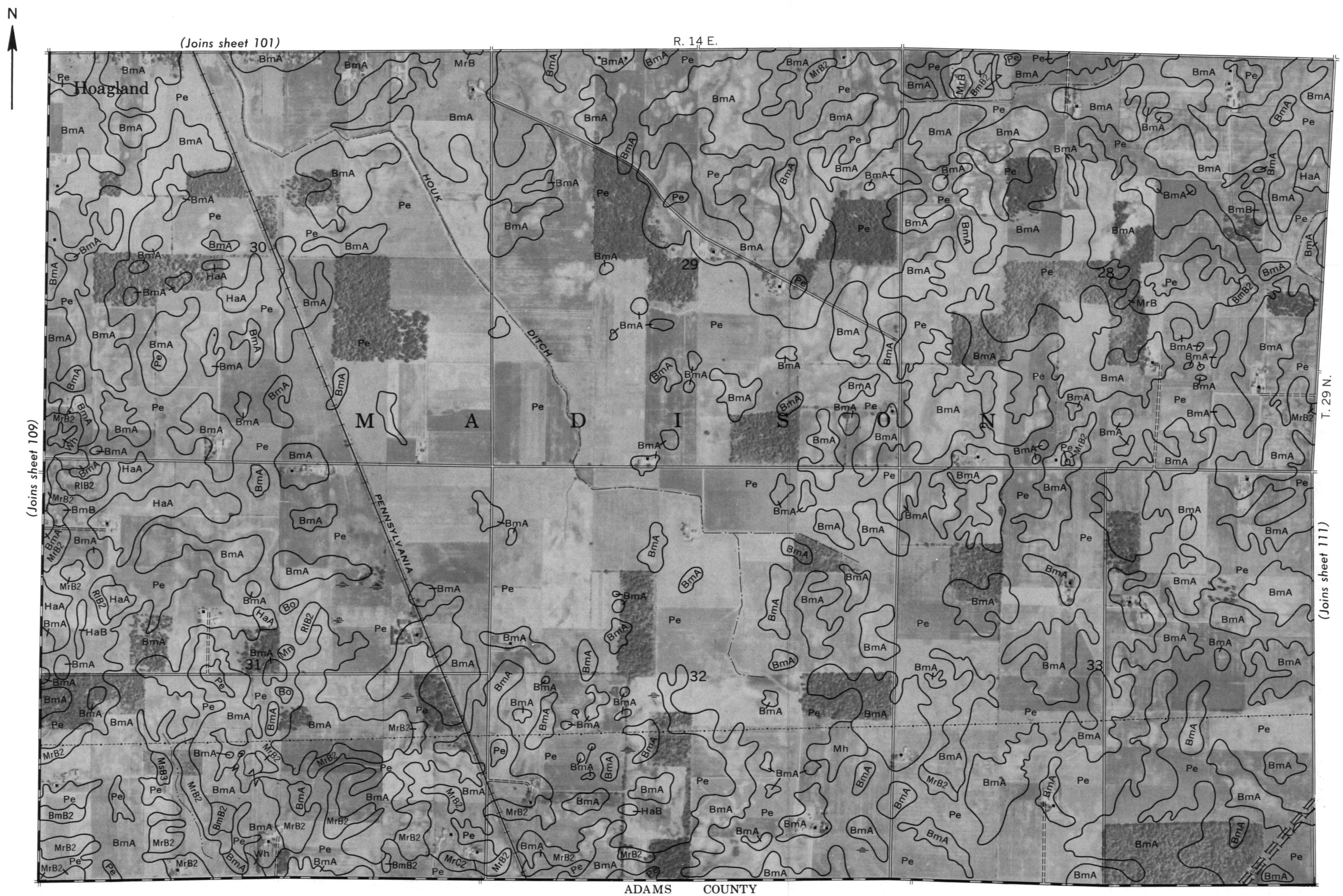
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 11



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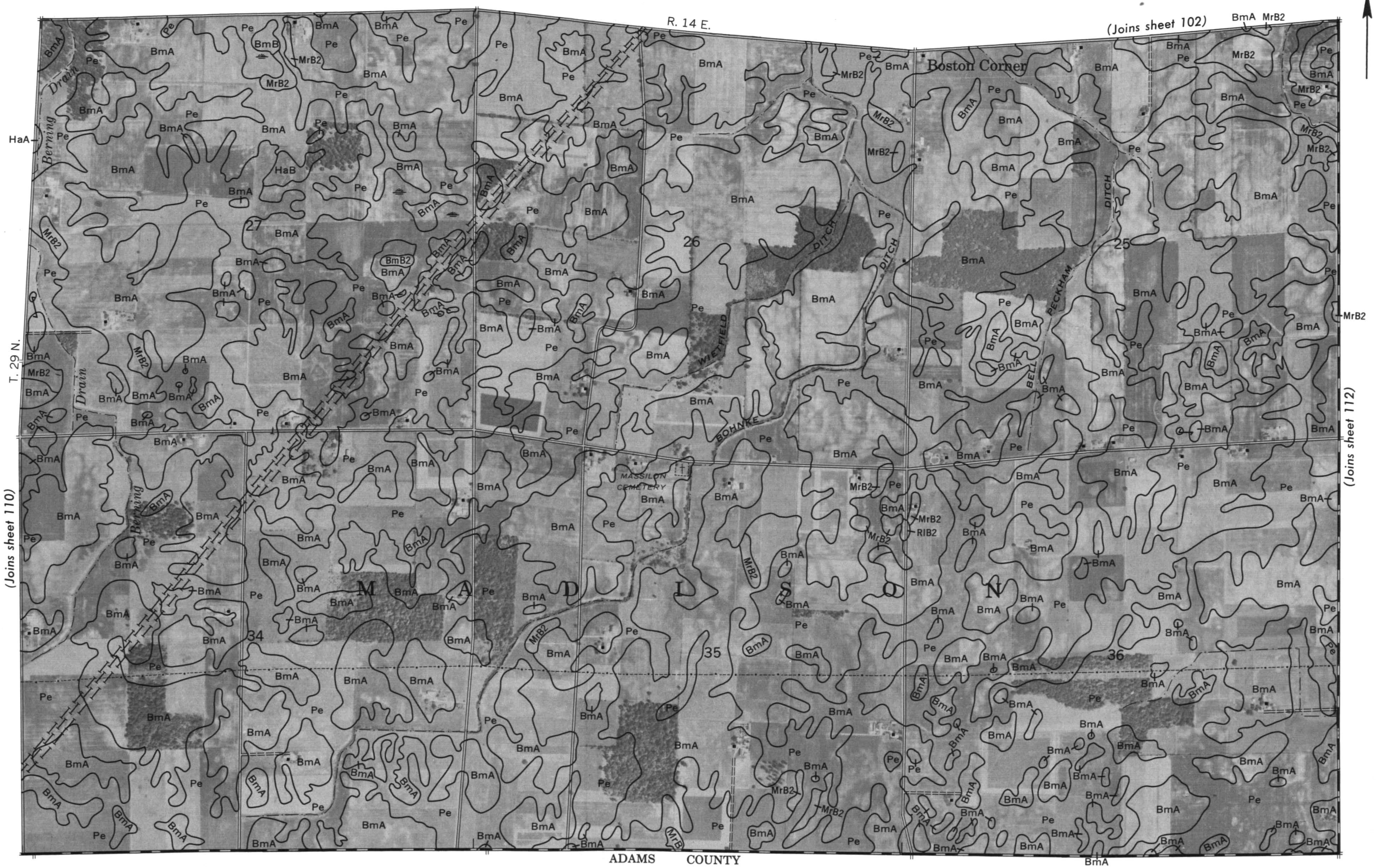
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 111

N



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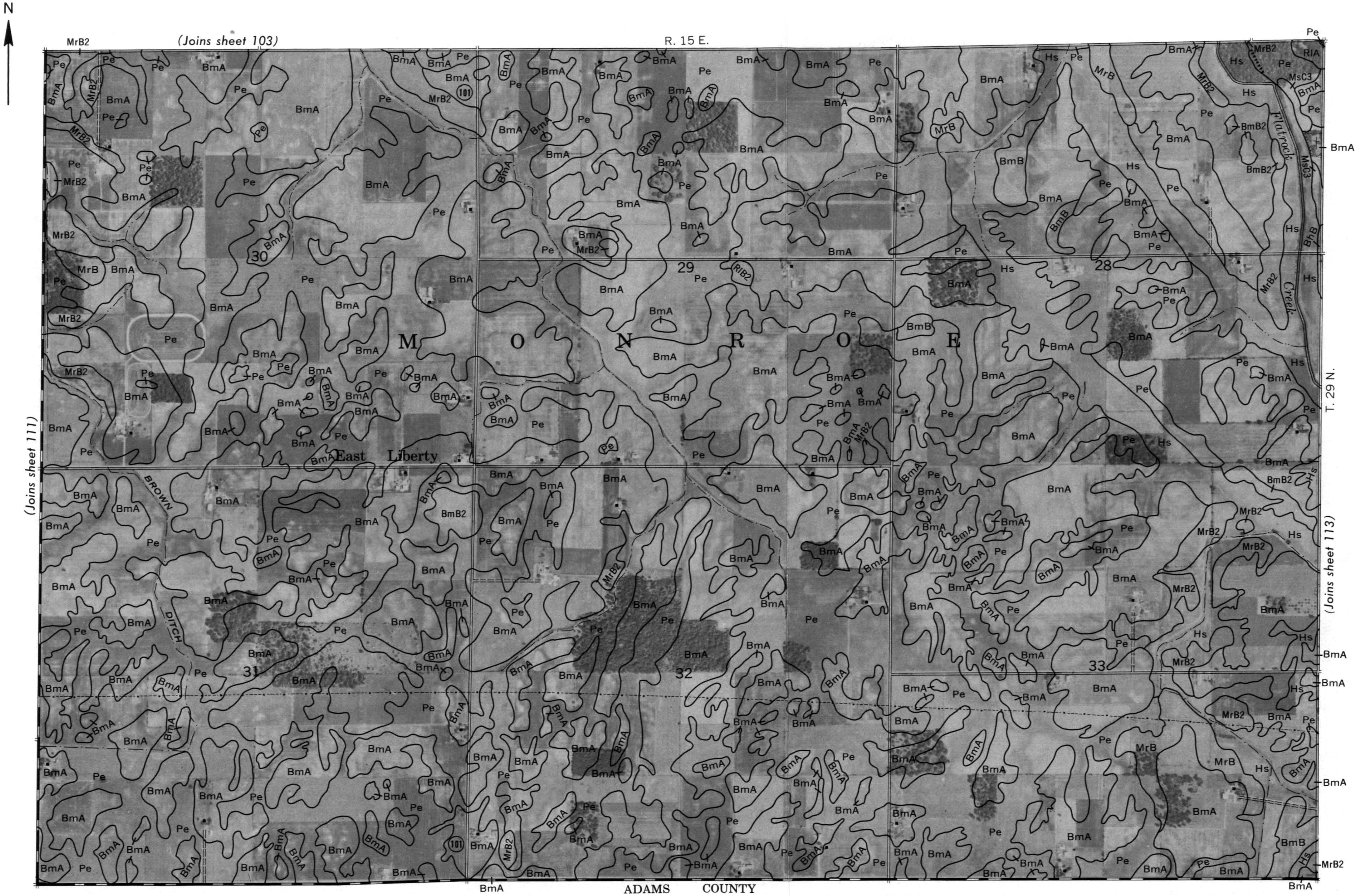
ALLEN COUNTY, INDIANA — SHEET NUMBER 112



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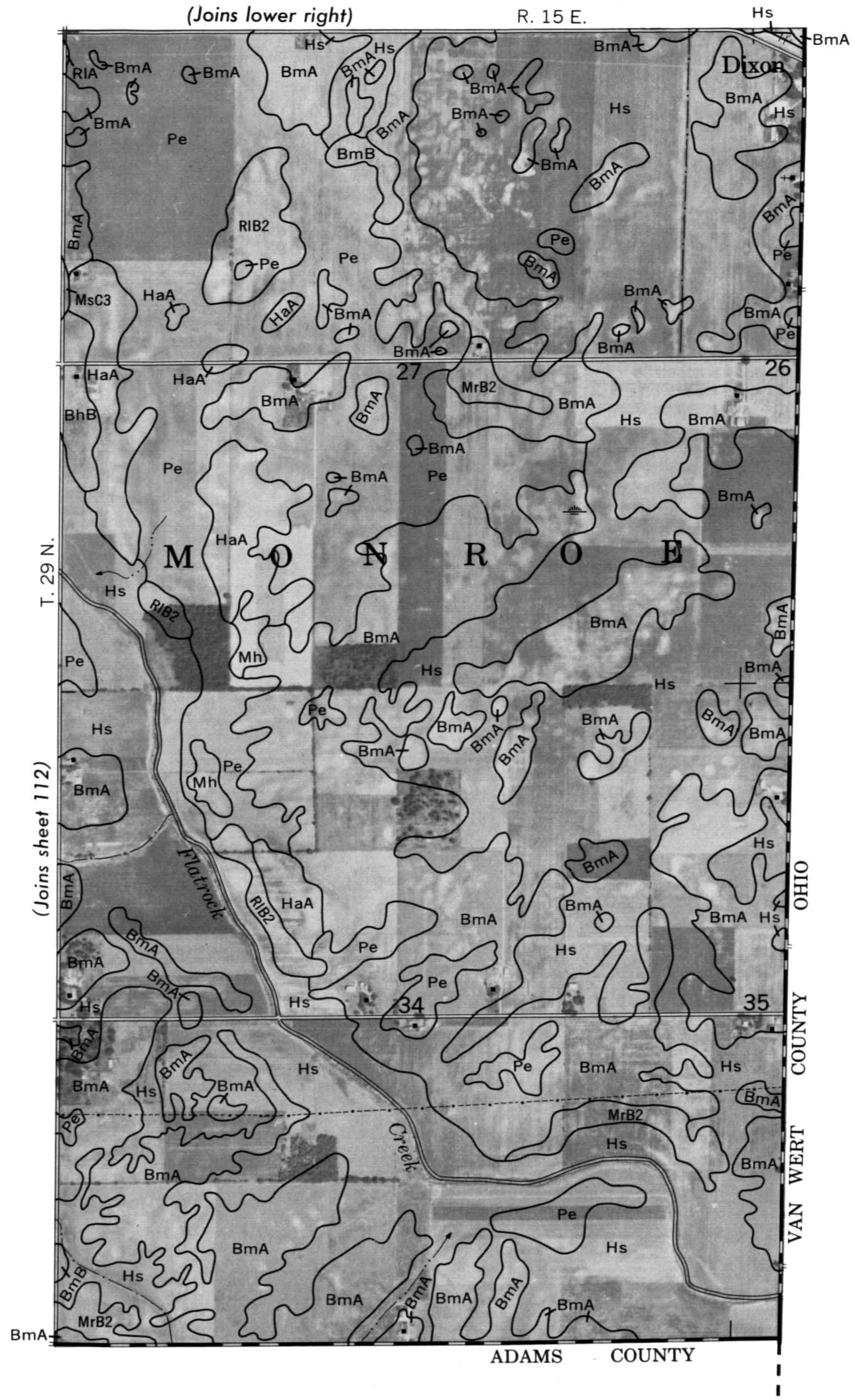

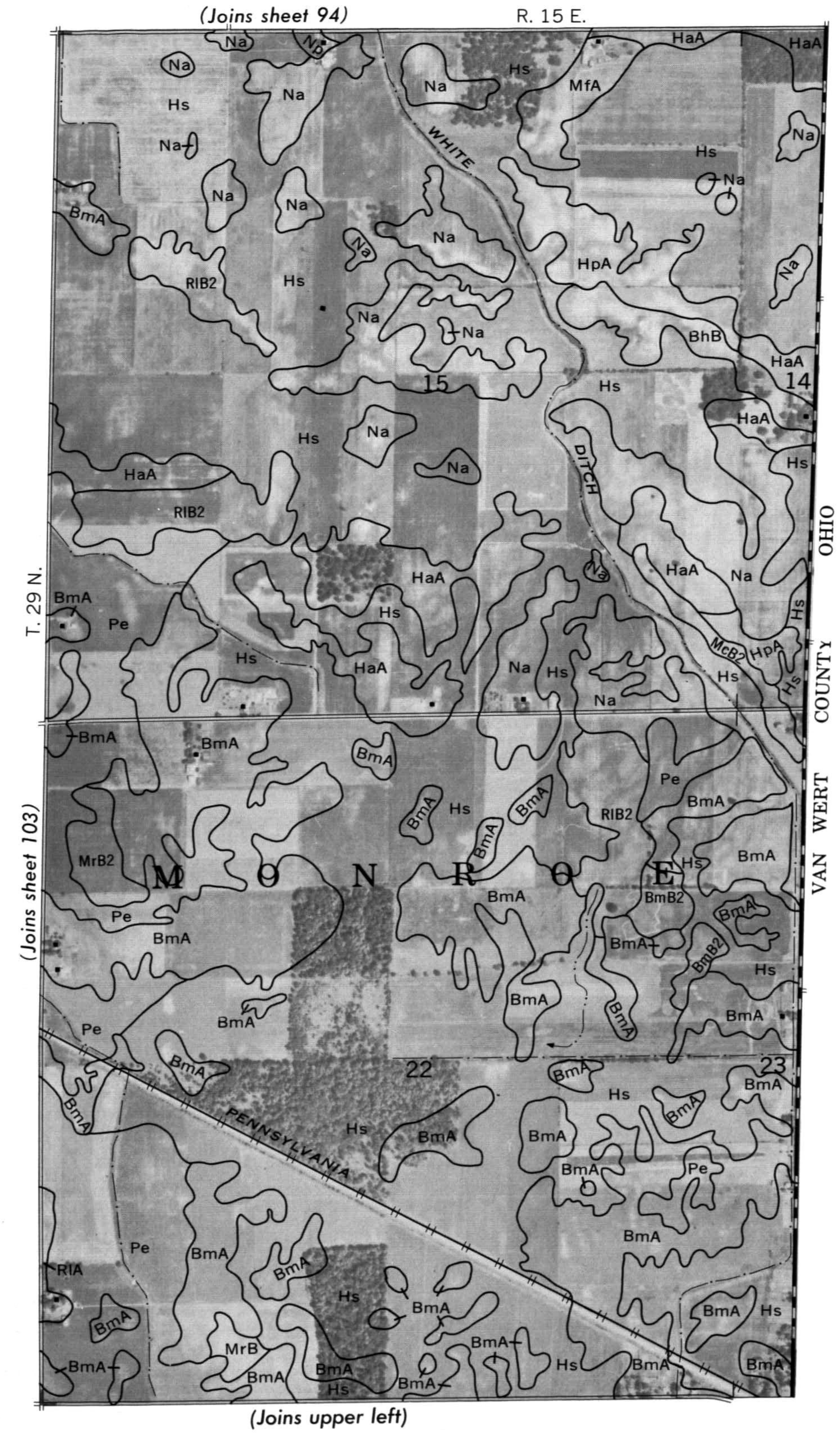

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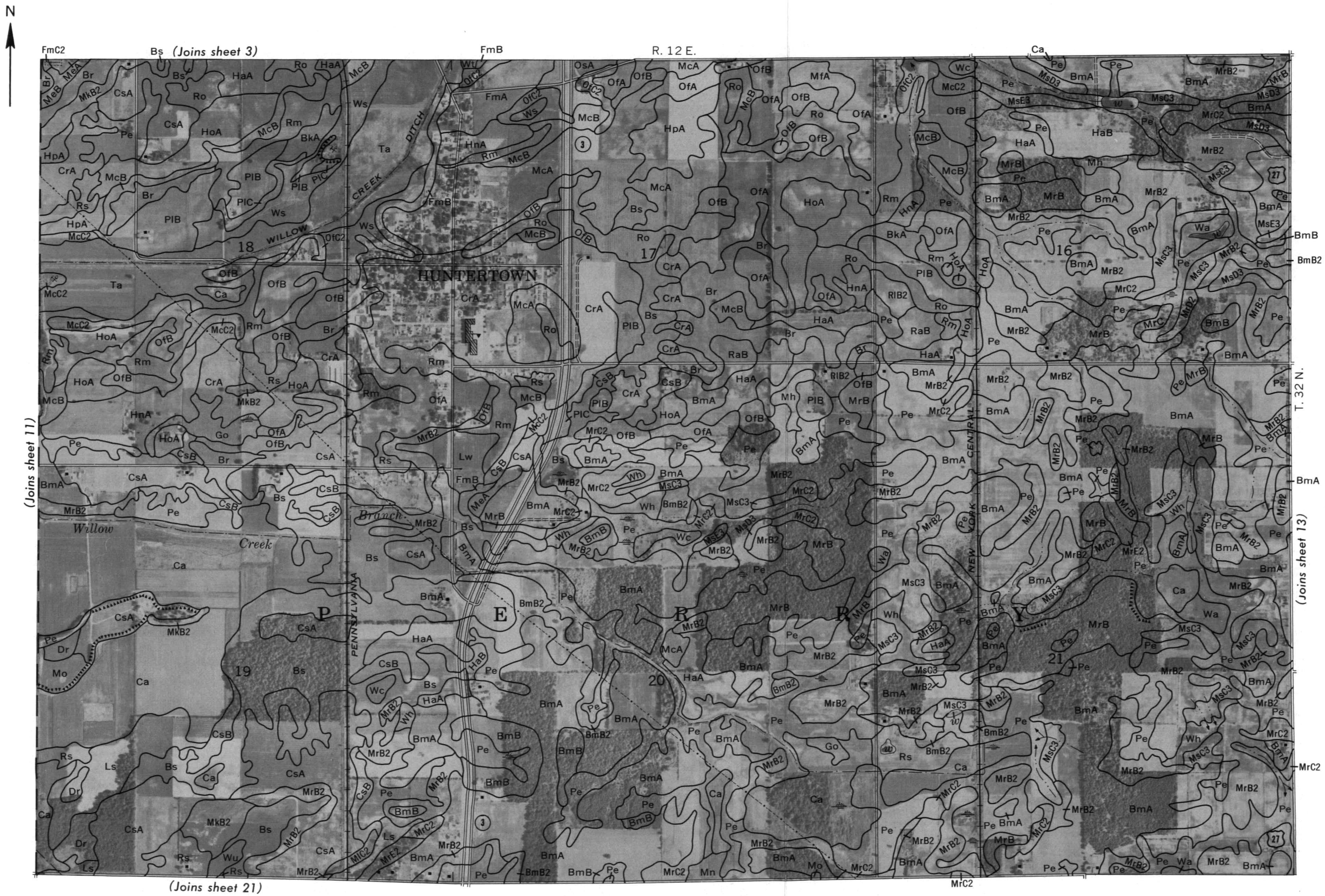
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA — SHEET NUMBER 12



0 ½ Mile Scale 1:15 840 0 3000 Feet

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Land division corners are approximately positioned on this map.

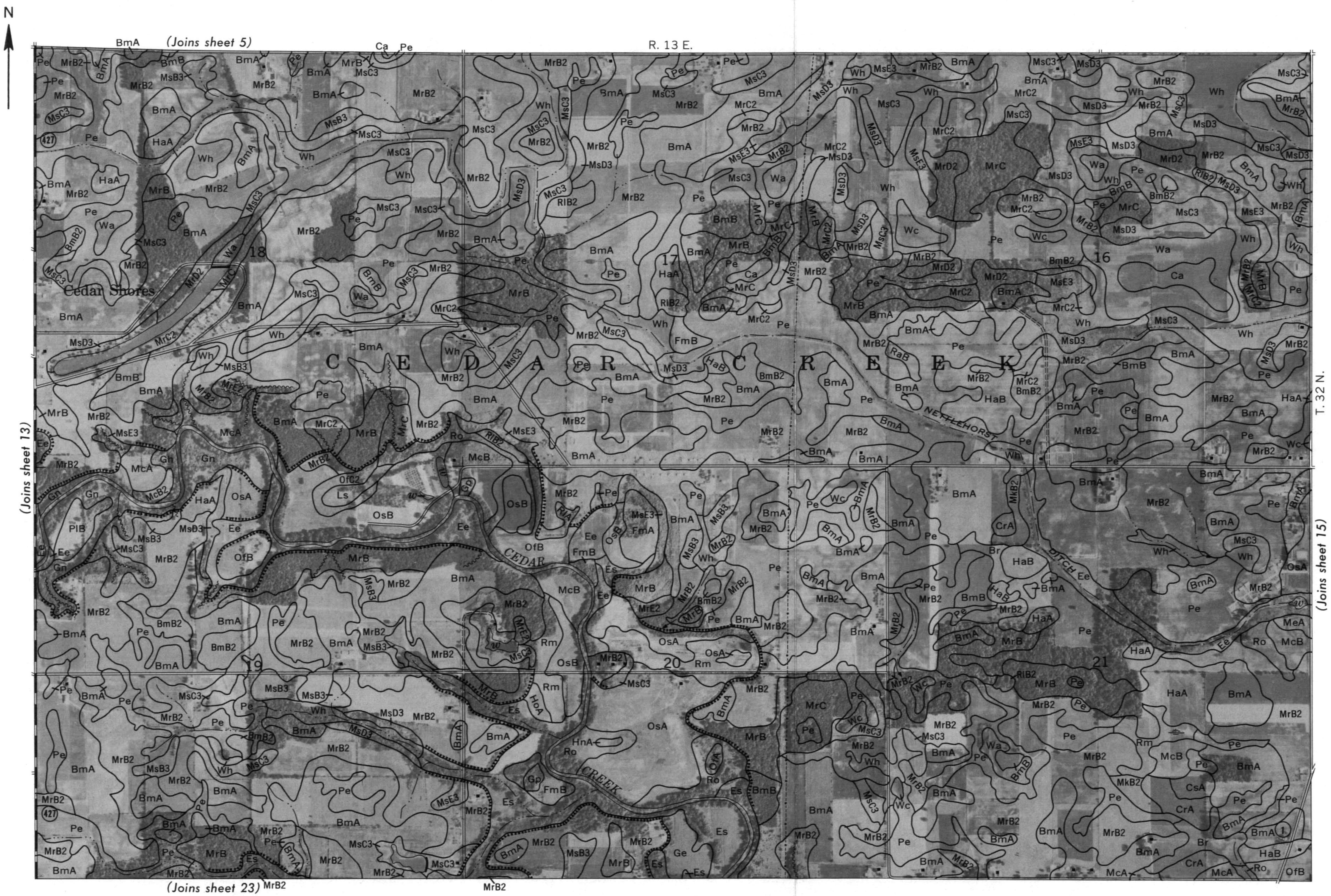
ALLEN COUNTY, INDIANA NO. 13

Scale 1:15 840

0 ½ Mile

0 3000 Feet

14



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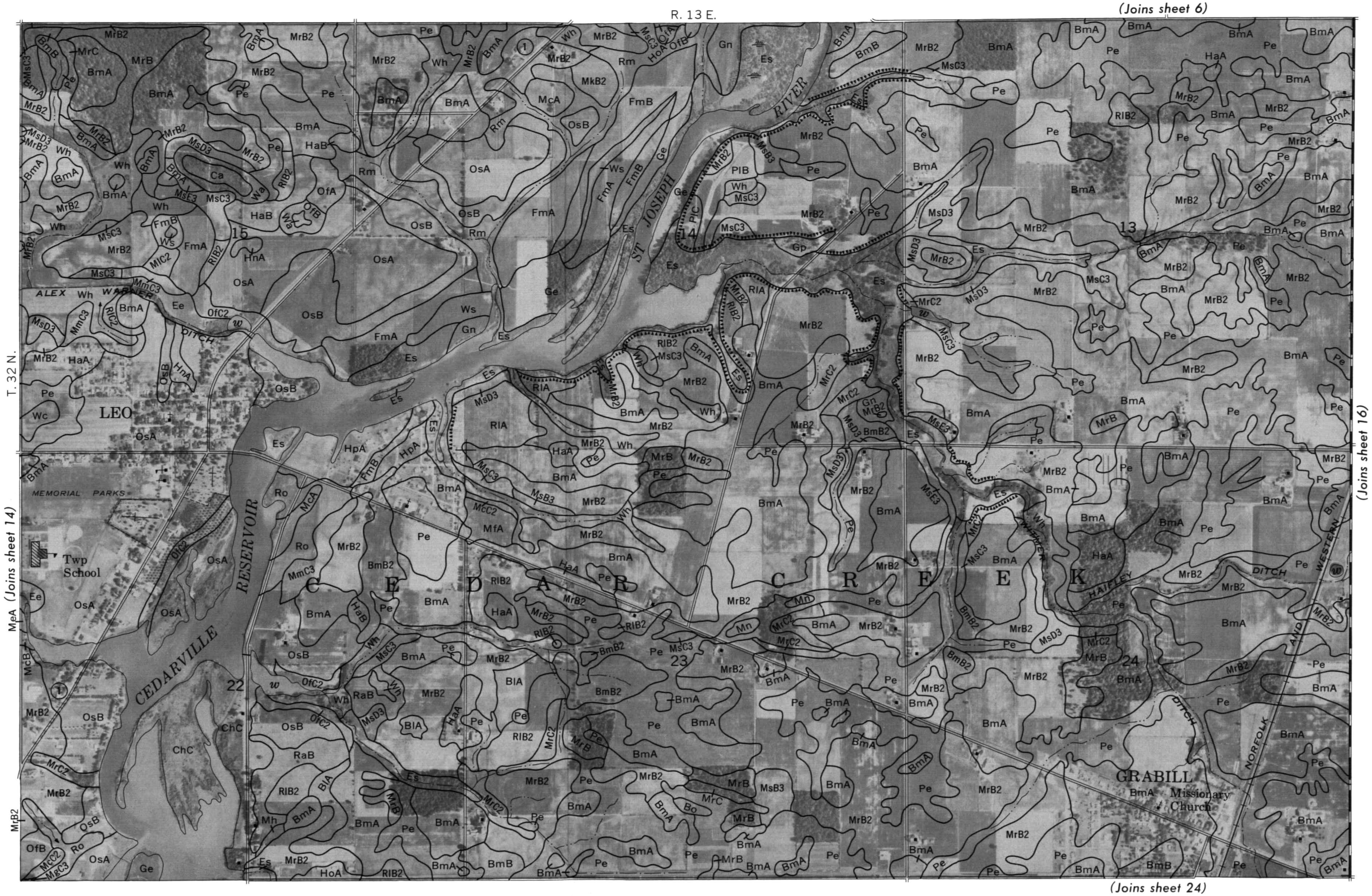
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 15



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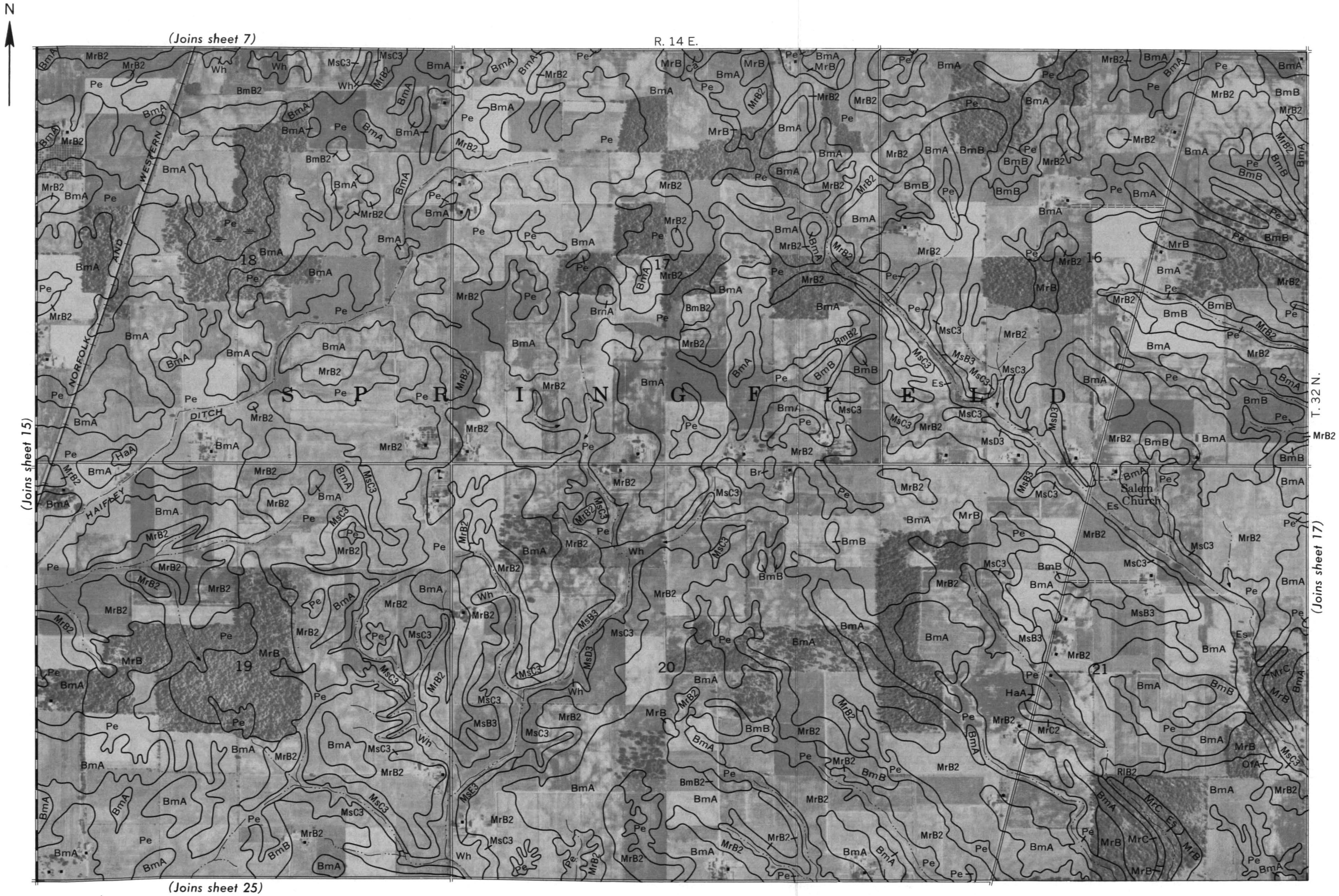

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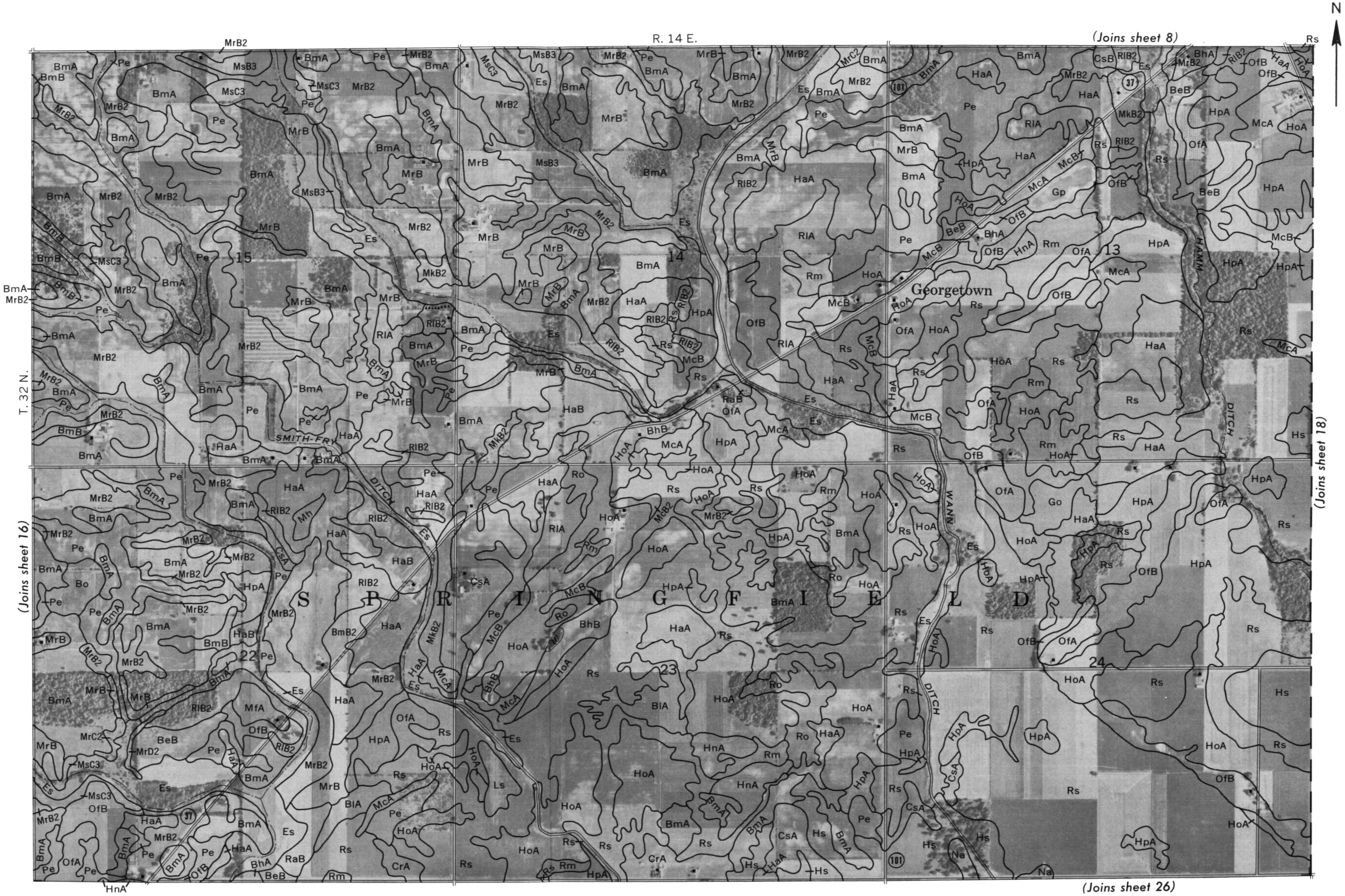
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 17



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0 ½ Mile Scale 1:15 840 0 3000 Feet

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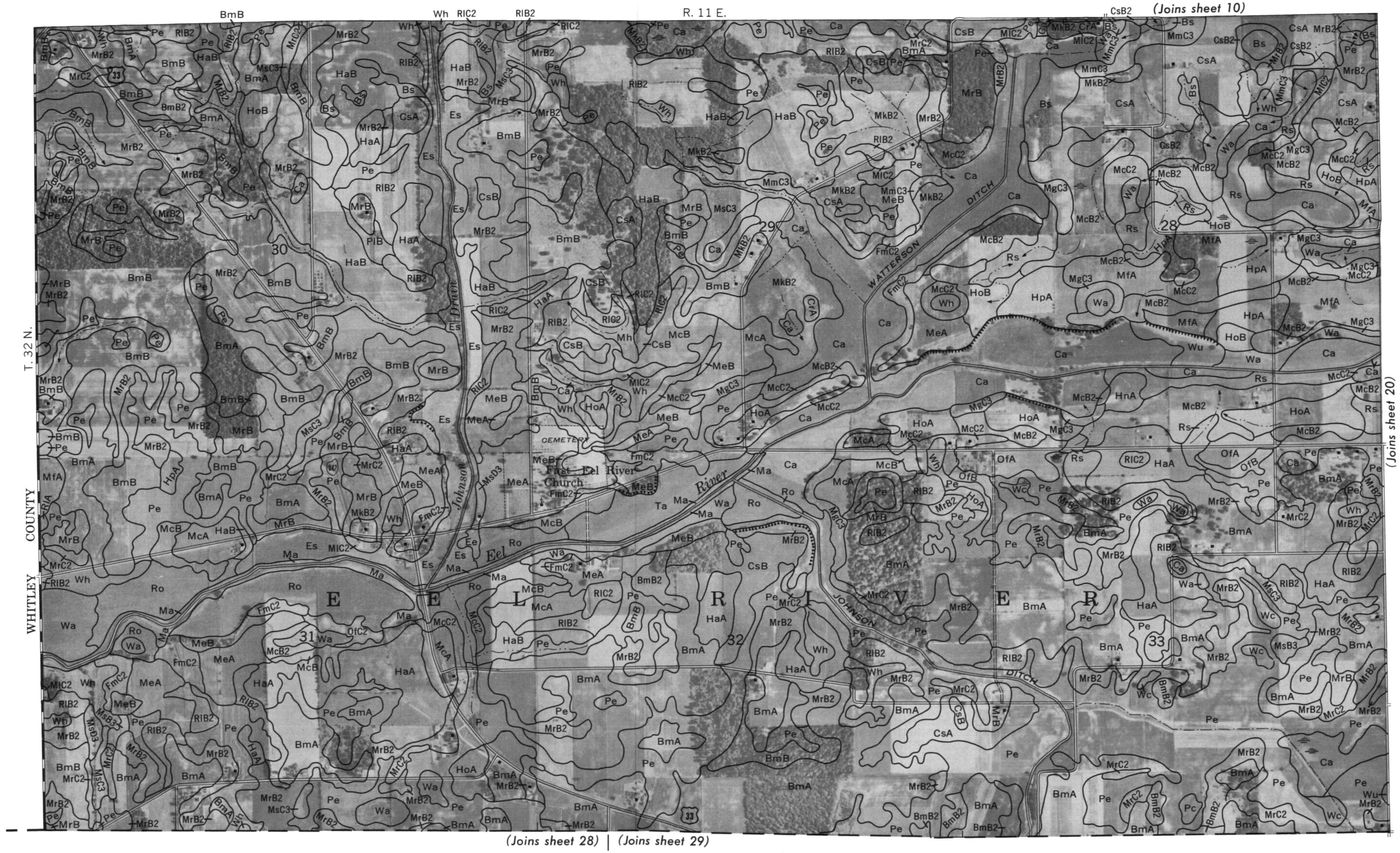
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 19

N



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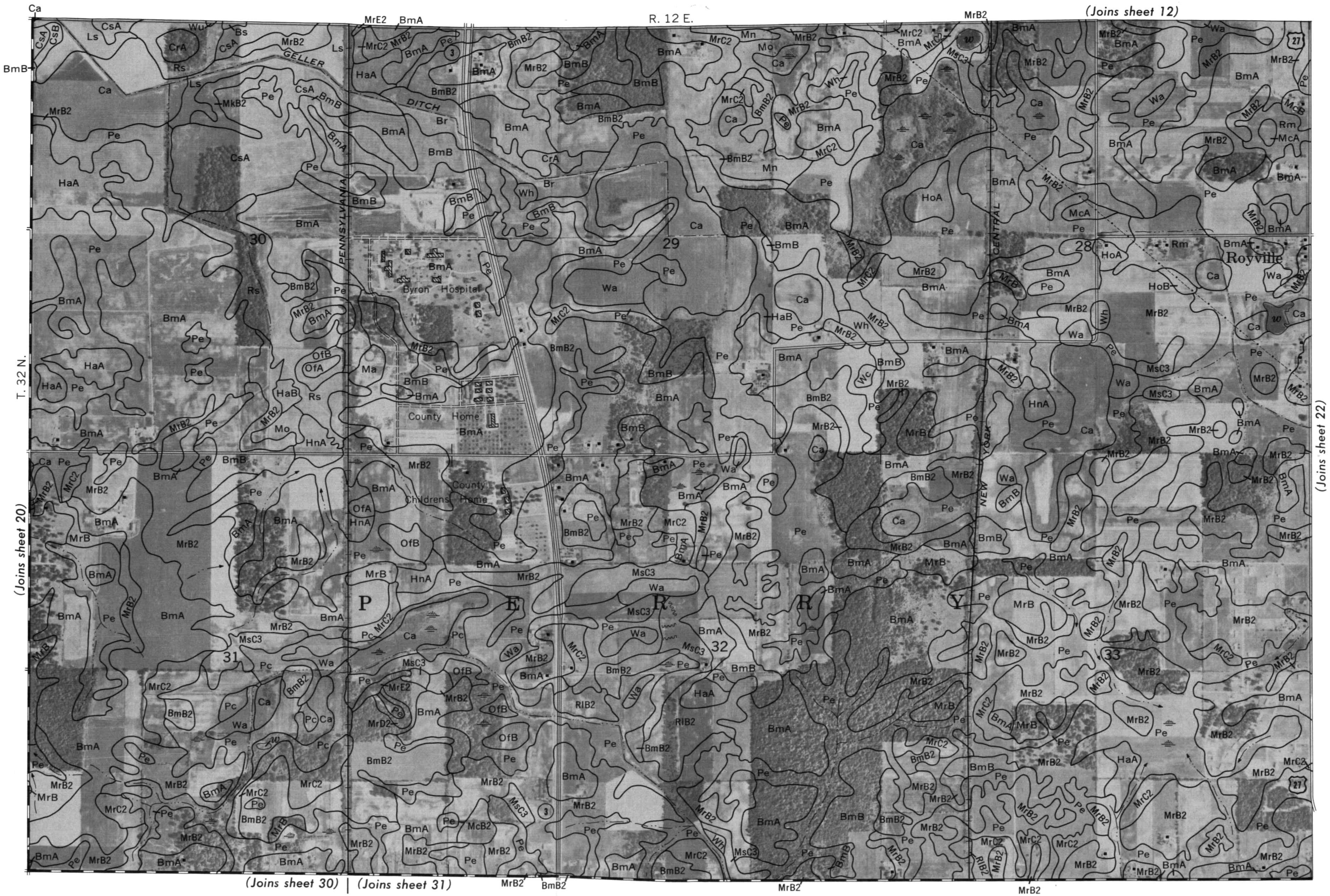
ALLEN COUNTY, INDIANA — SHEET NUMBER 20

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 21



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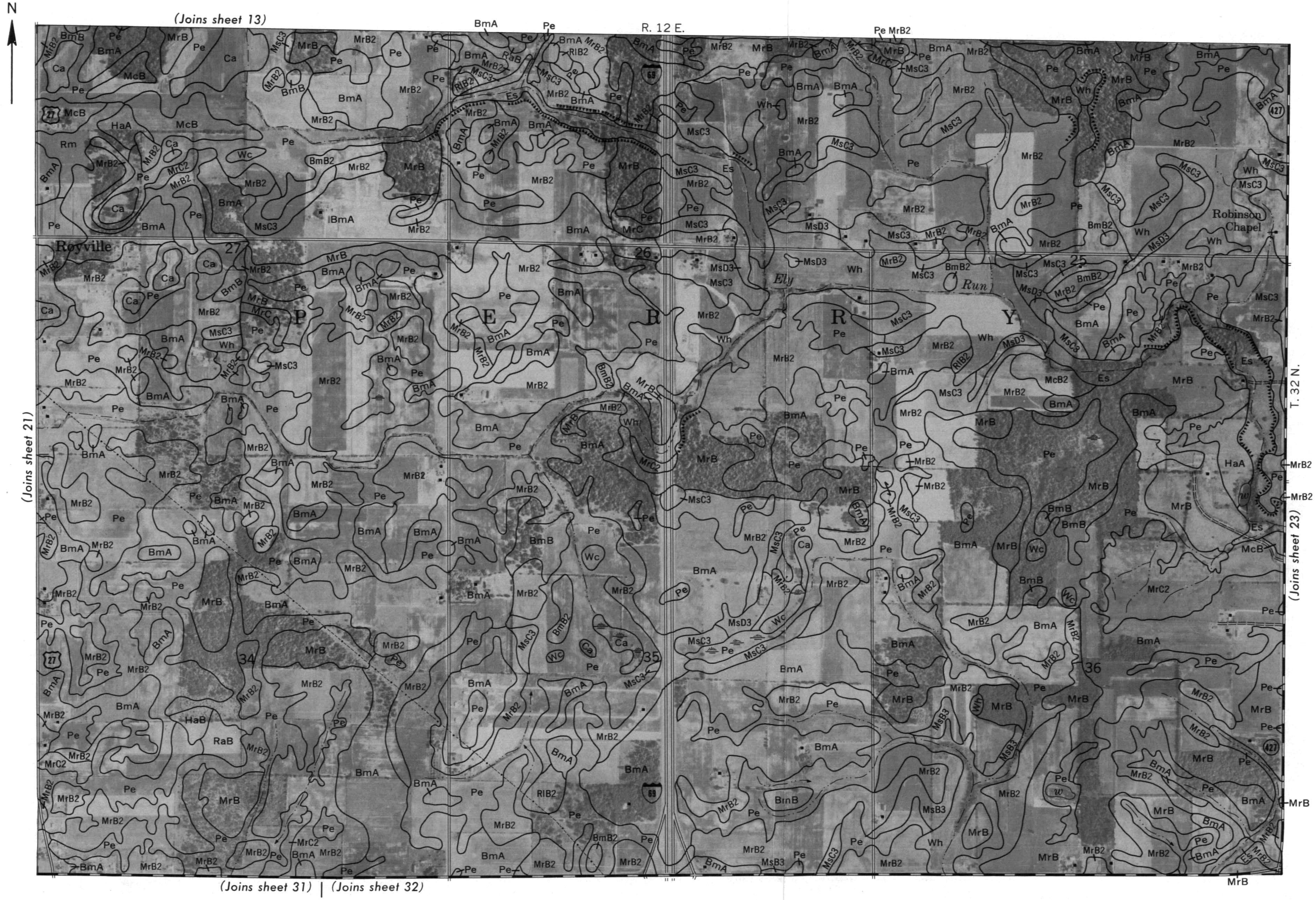

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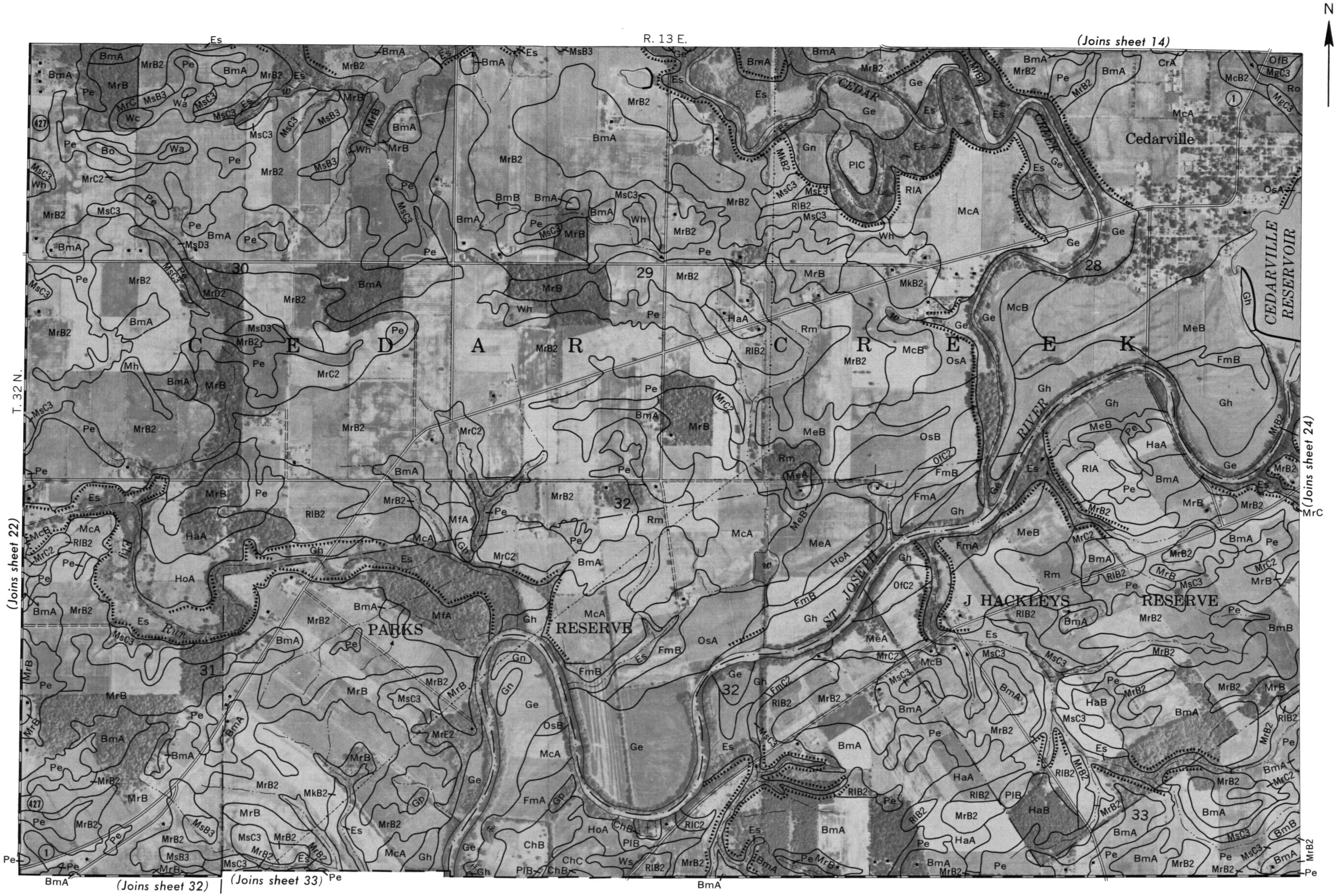
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 23



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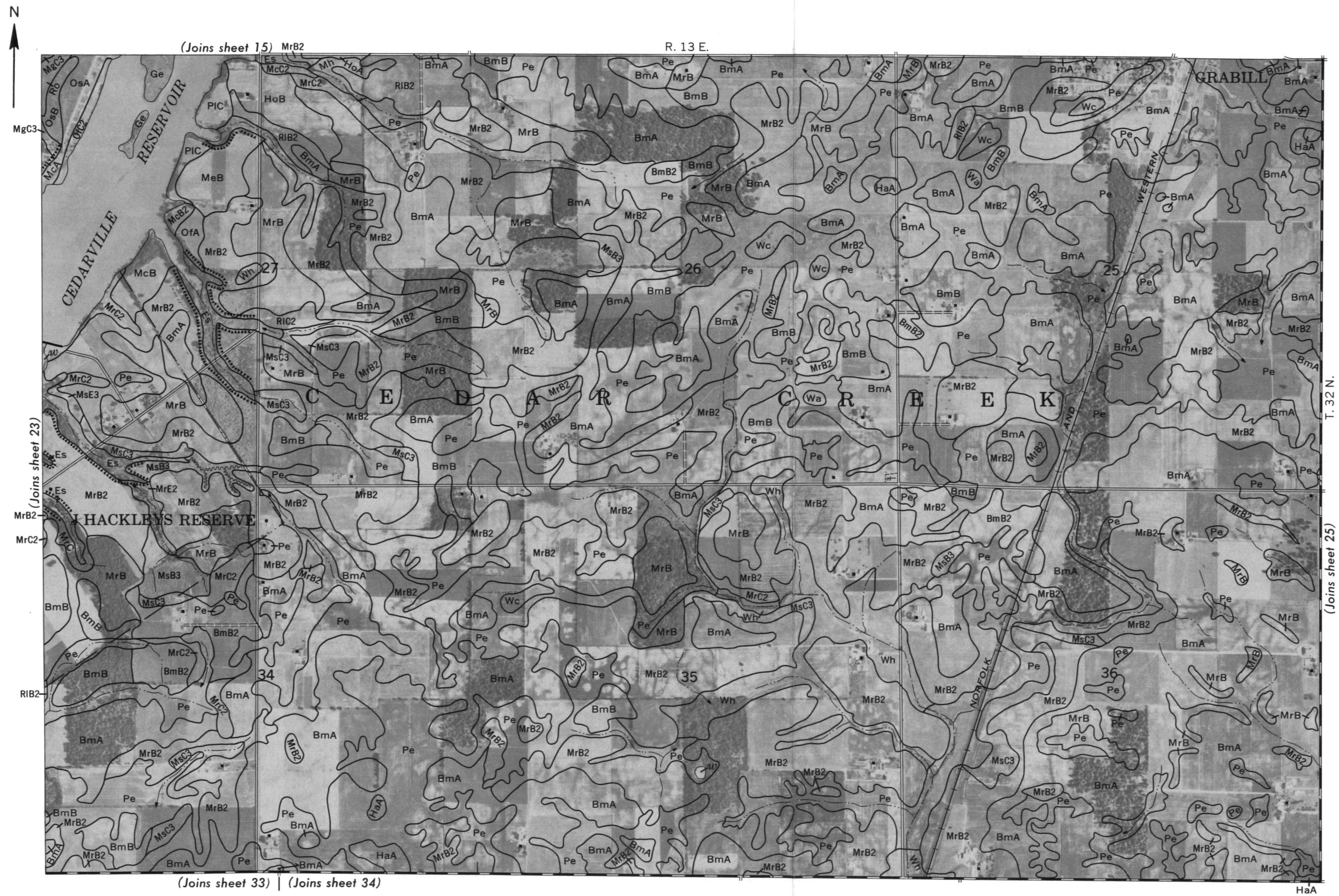

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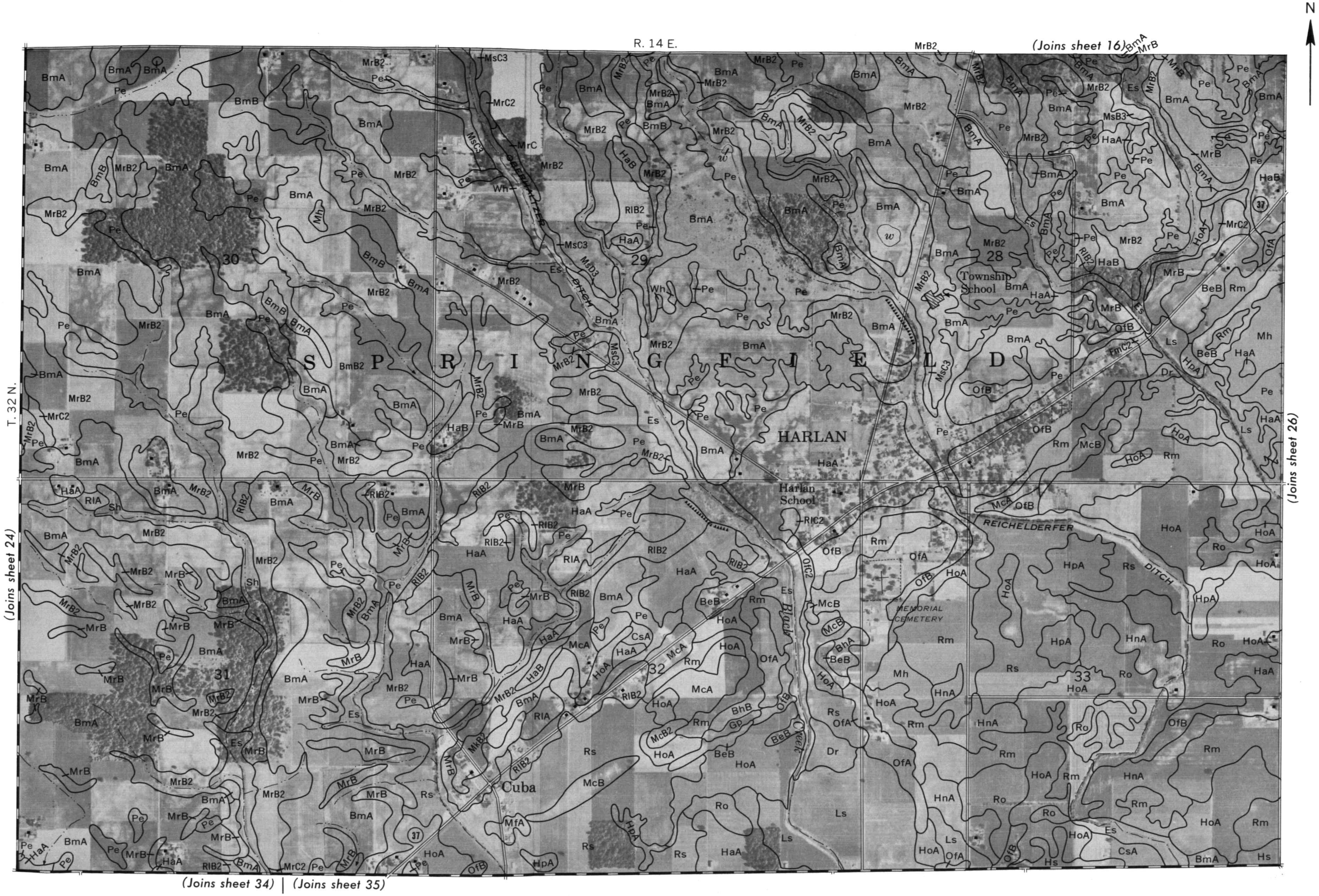
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 25



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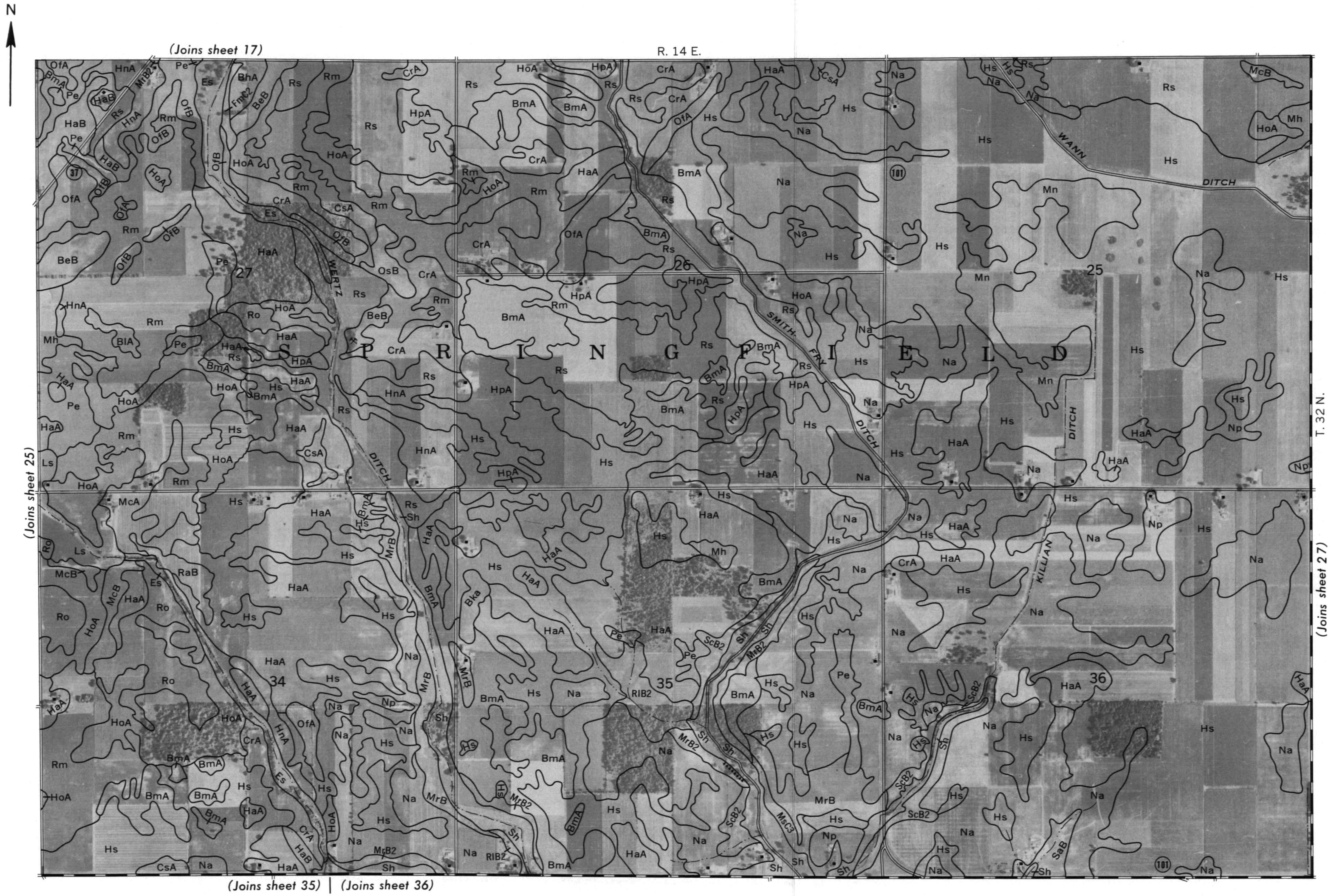
ALLEN COUNTY, INDIANA — SHEET NUMBER 26



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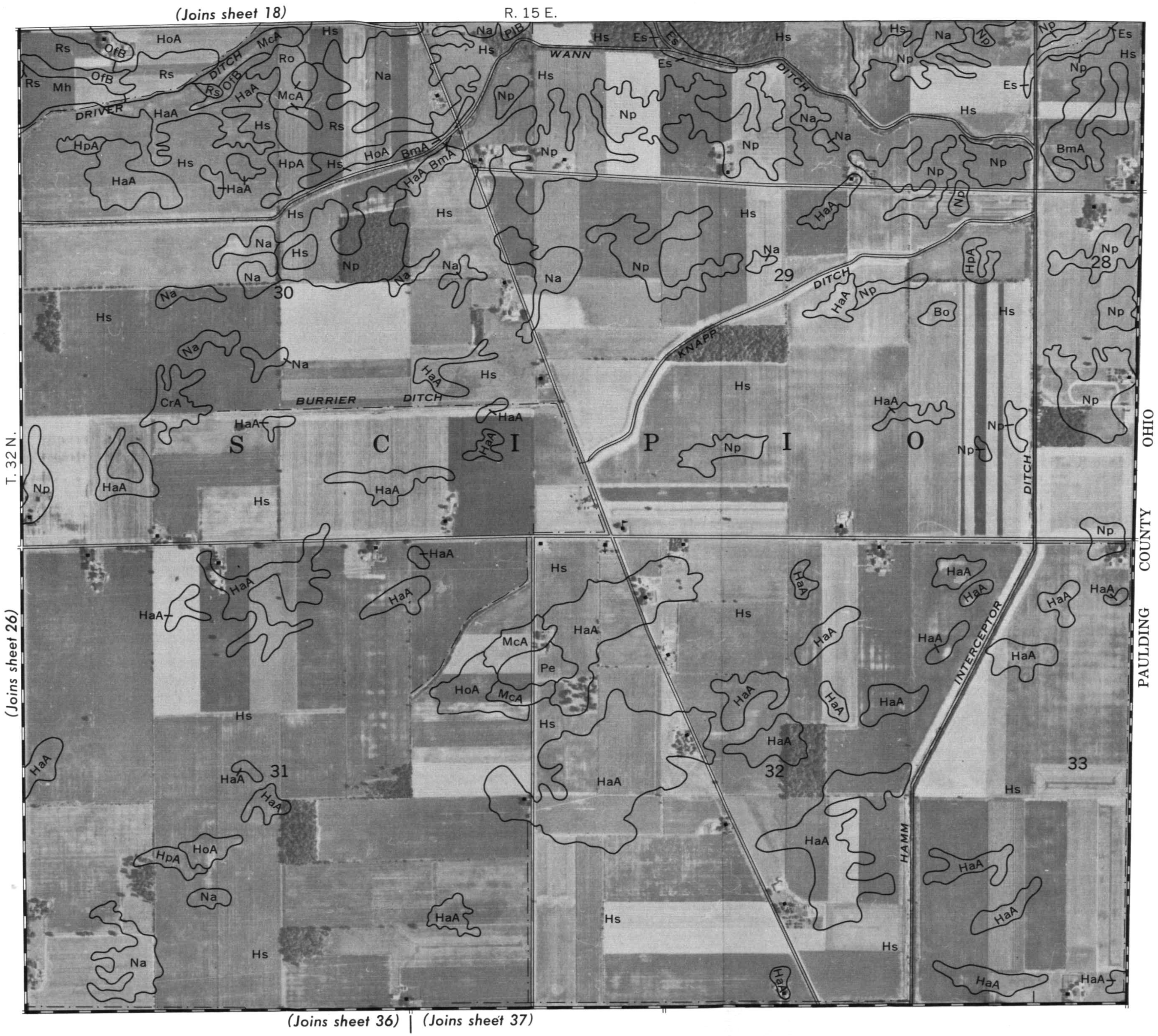

0 ½ Mile Scale 1:15 840 0 3000 Feet

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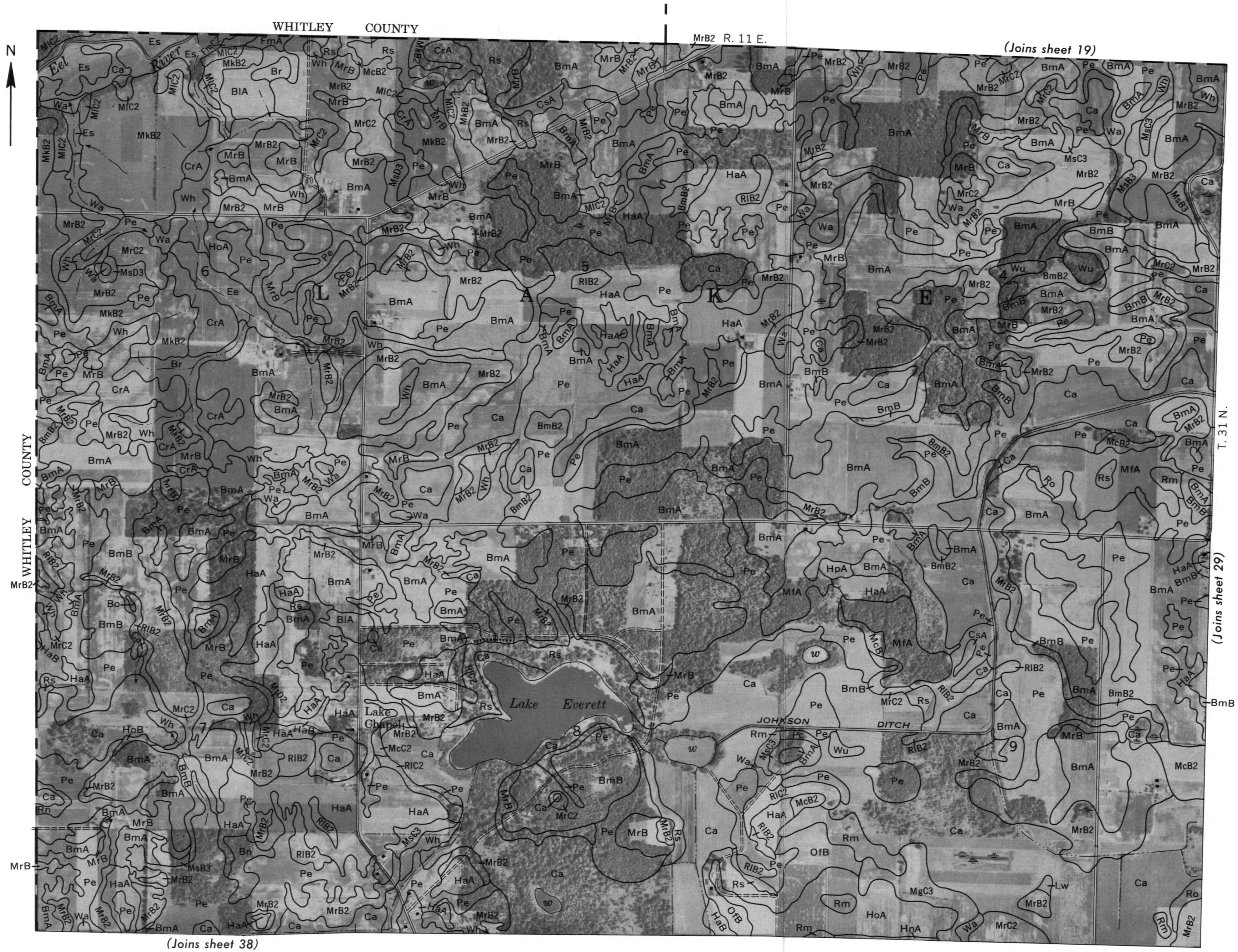
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 27



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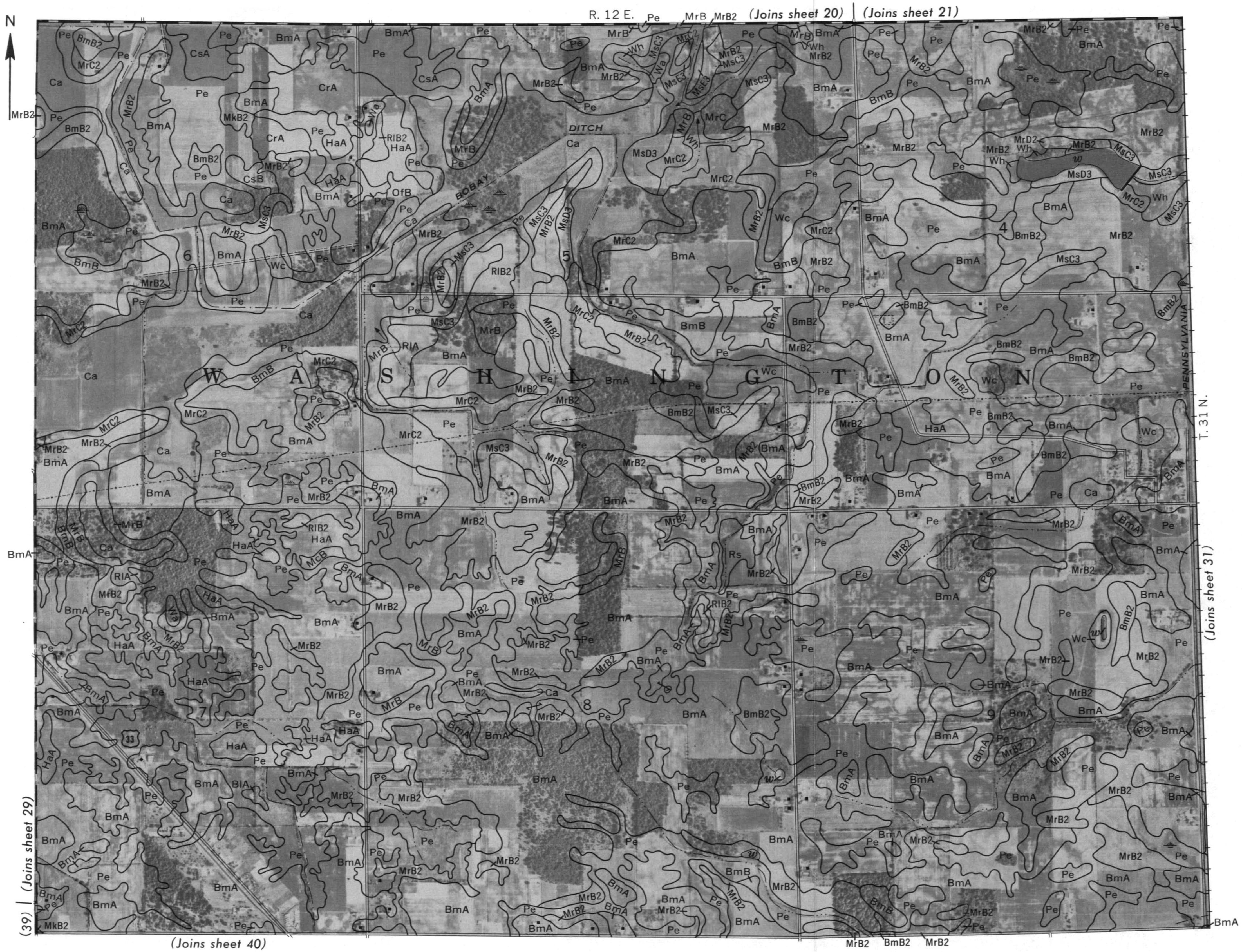
ALLEN COUNTY, INDIANA NO. 28

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 29

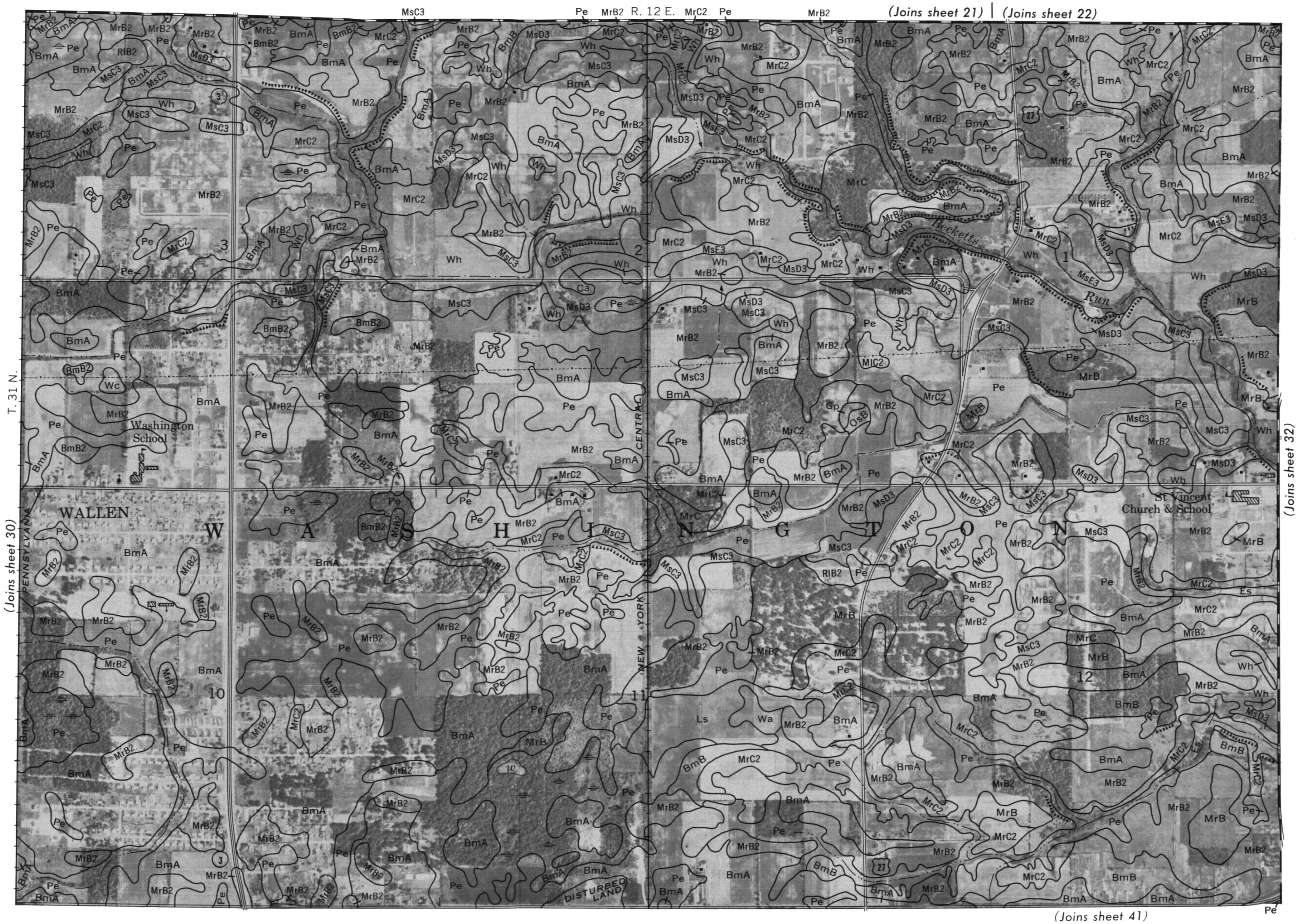
0 ½ Mile Scale 1:15 840 0 3000 Feet



0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 31



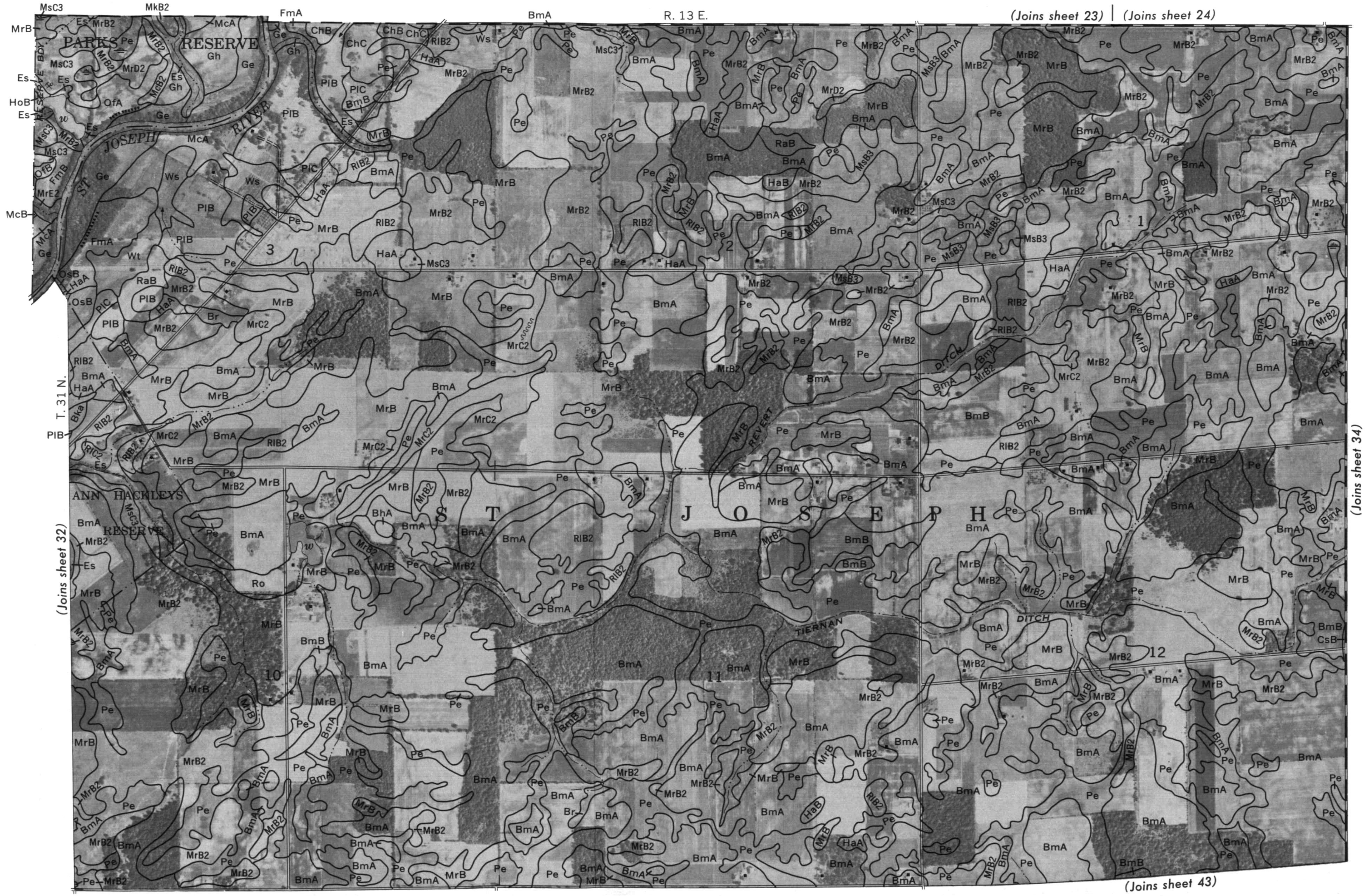
0 ½ Mile Scale 1:15 840 0 3000 Feet

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station

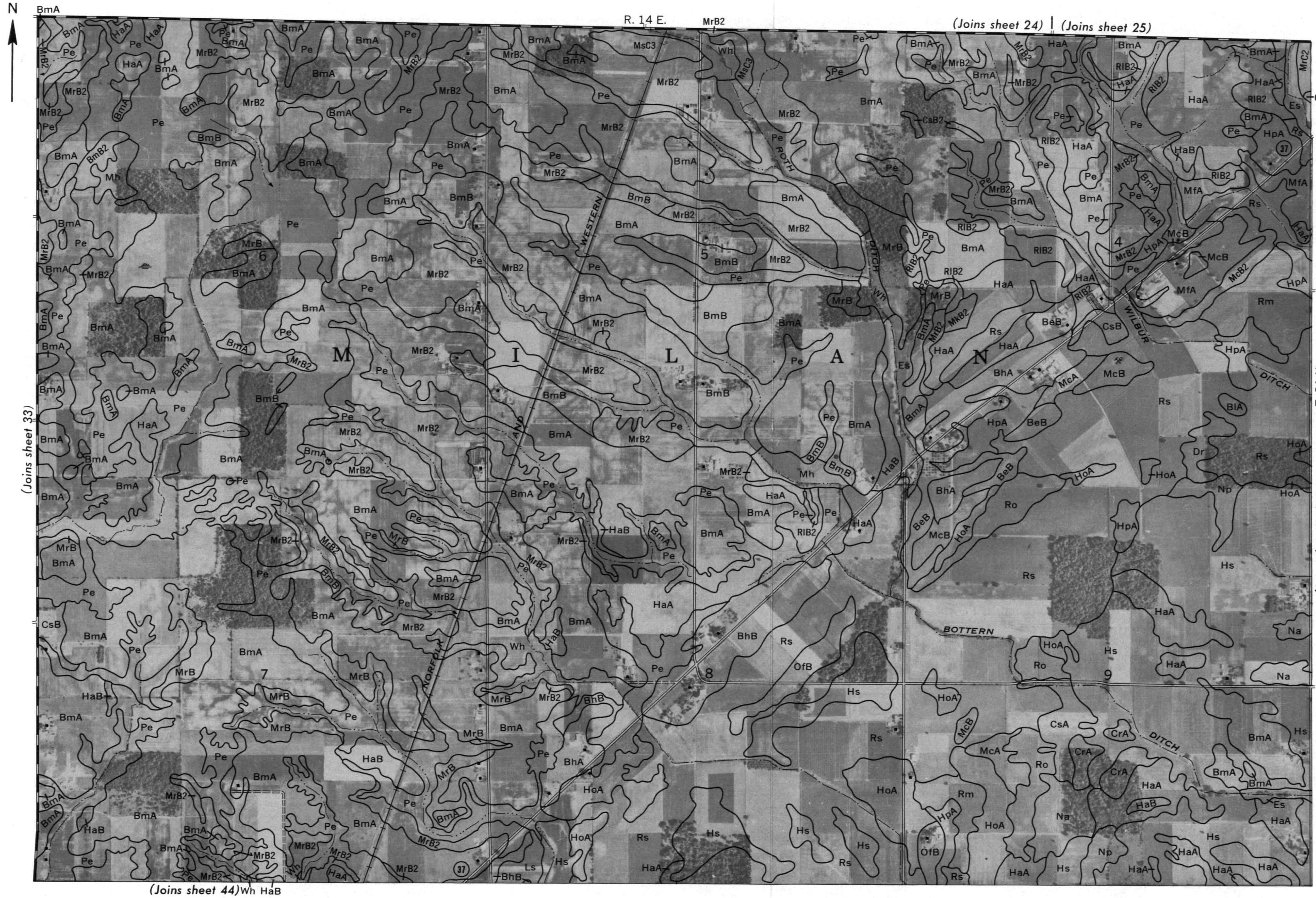
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 33



0 ½ Mile Scale 1:15 840 0 3000 Feet

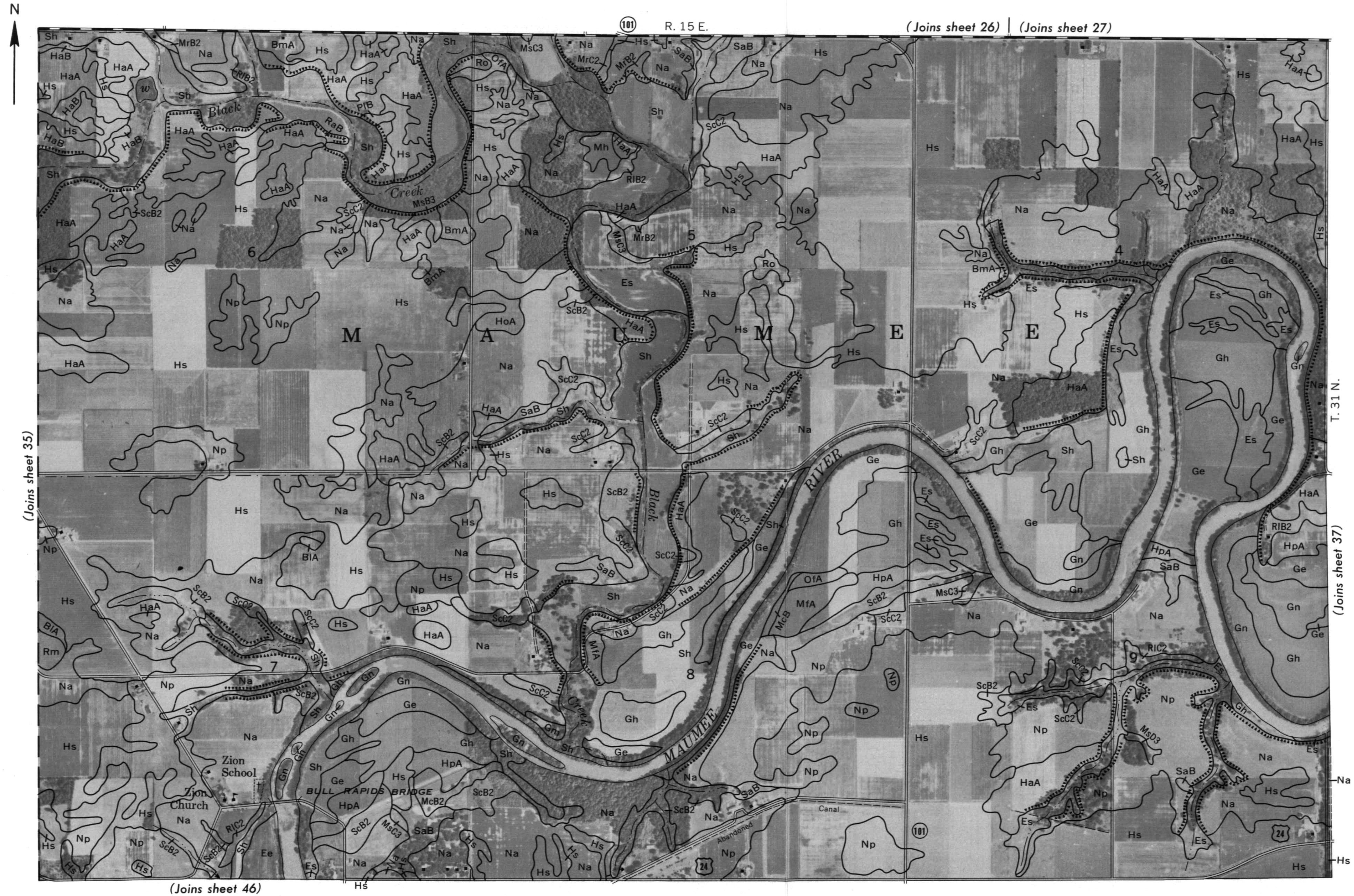
ALLEN COUNTY, INDIANA — SHEET NUMBER 34



0 ½ Mile Scale 1:15 840 0 3000 Feet

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.



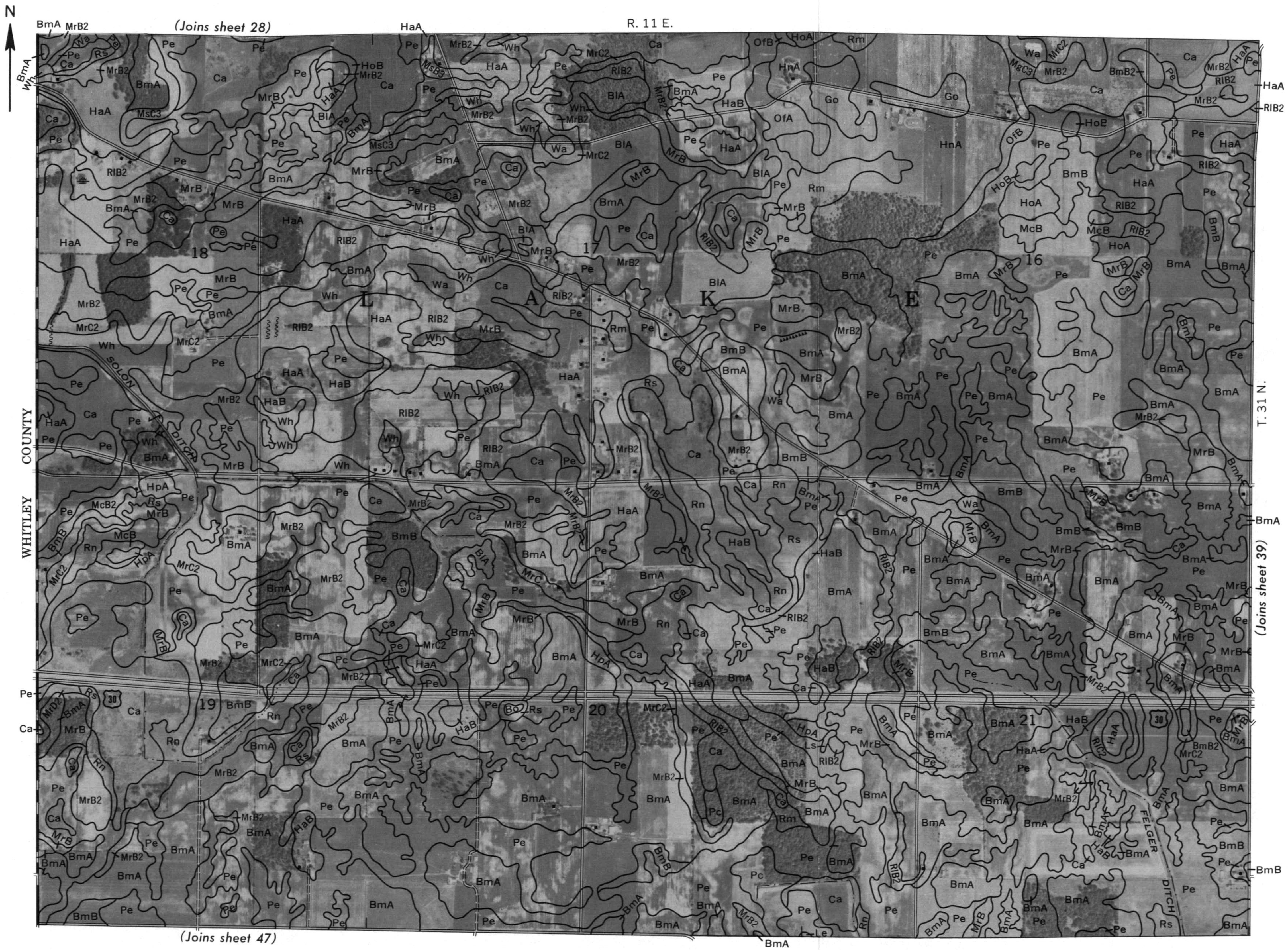
0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 37

0 ½ Mile Scale 1:15 840 0 3000 Feet

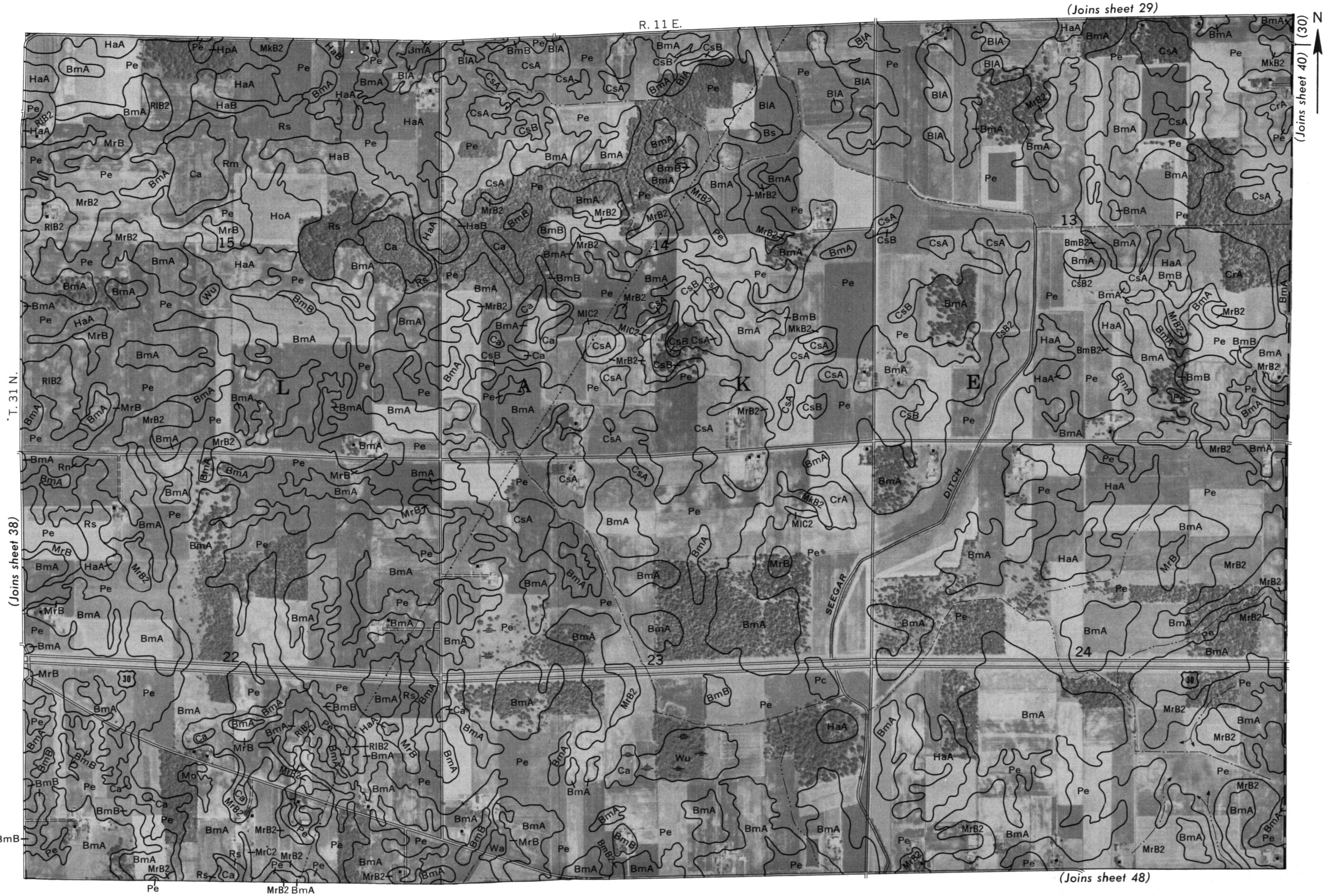
ALLEN COUNTY, INDIANA — SHEET NUMBER 38



0 ½ Mile Scale 1:15 840 0 3000 Feet

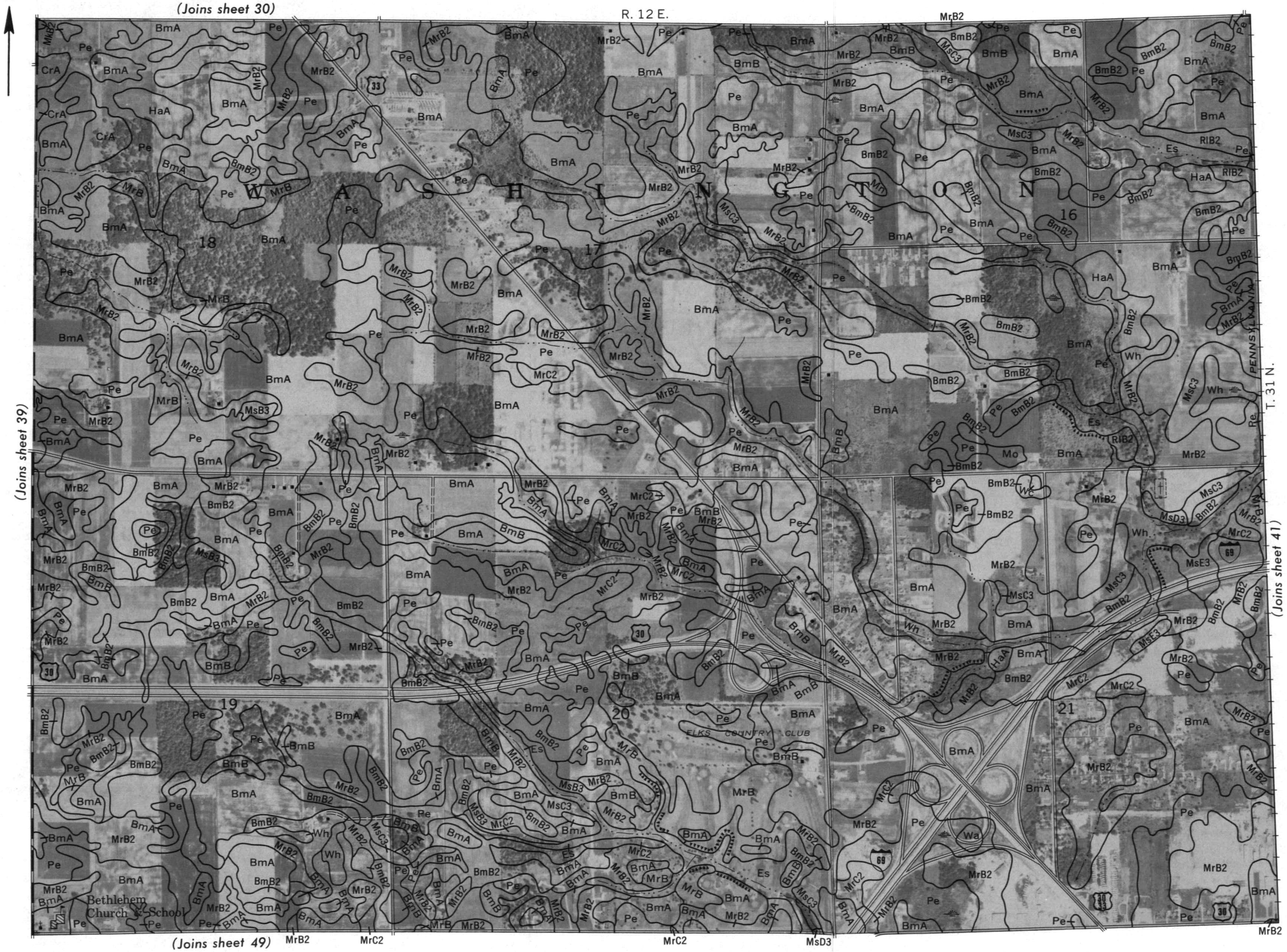
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 39

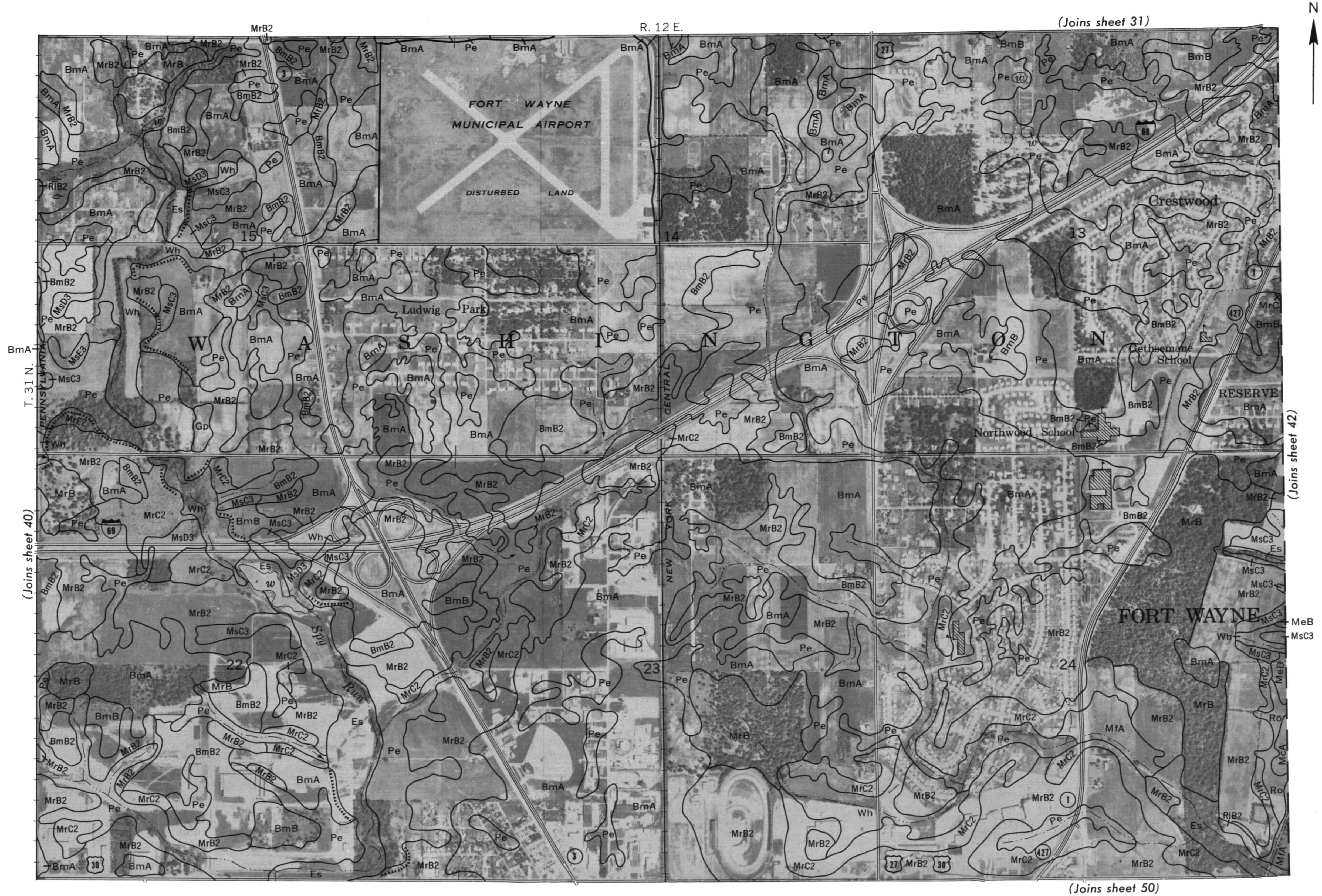


0 ½ Mile Scale 1:15 840 0 3000 Feet

N



0 ½ Mile Scale 1:15 840 0 3000 Feet



0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.

Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 41

ALLEN COUNTY, INDIANA — SHEET NUMBER 42

0 ½ Mile Scale 1:15 840 0 3000 Feet

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 43

ALLEN COUNTY, INDIANA — SHEET NUMBER 44

N

(Joins sheet 34)

(Joins sheet 53)

0 ½ Mile Scale 1:15 840 0 3000 Feet

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

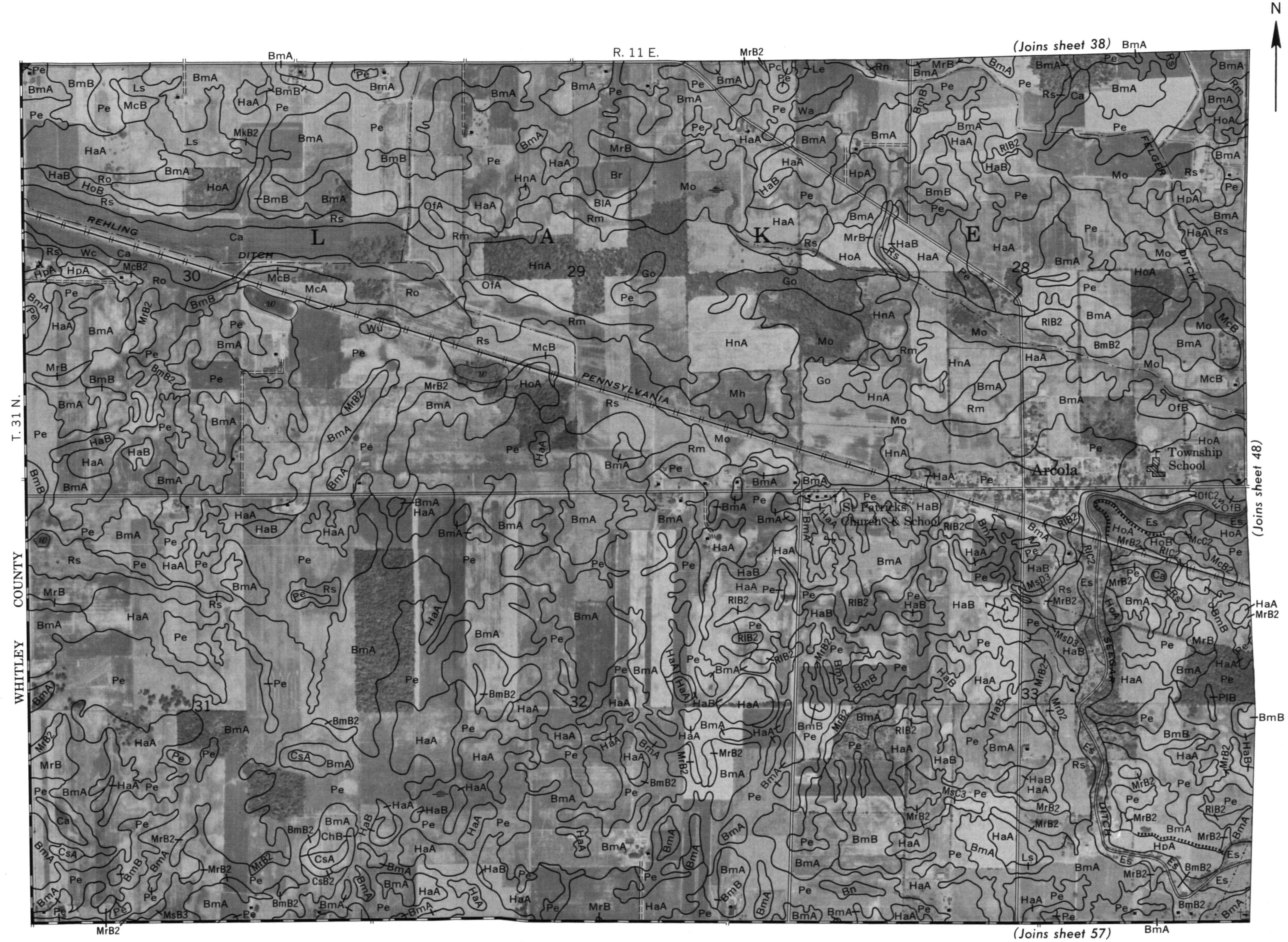
ALLEN COUNTY, INDIANA NO. 45

ALLEN COUNTY, INDIANA — SHEET NUMBER 46

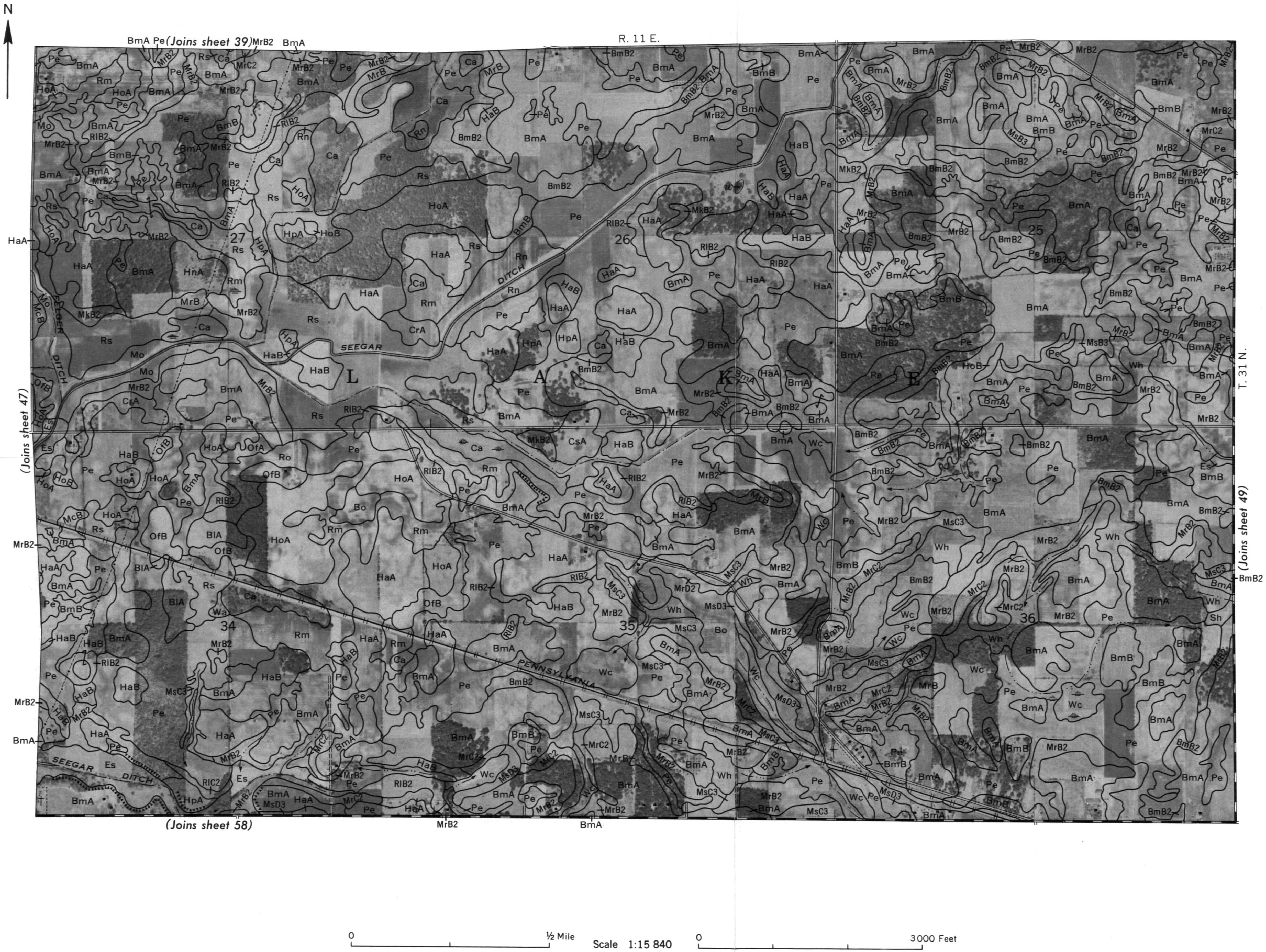
0 ½ Mile Scale 1:15 840 0 3000 Feet

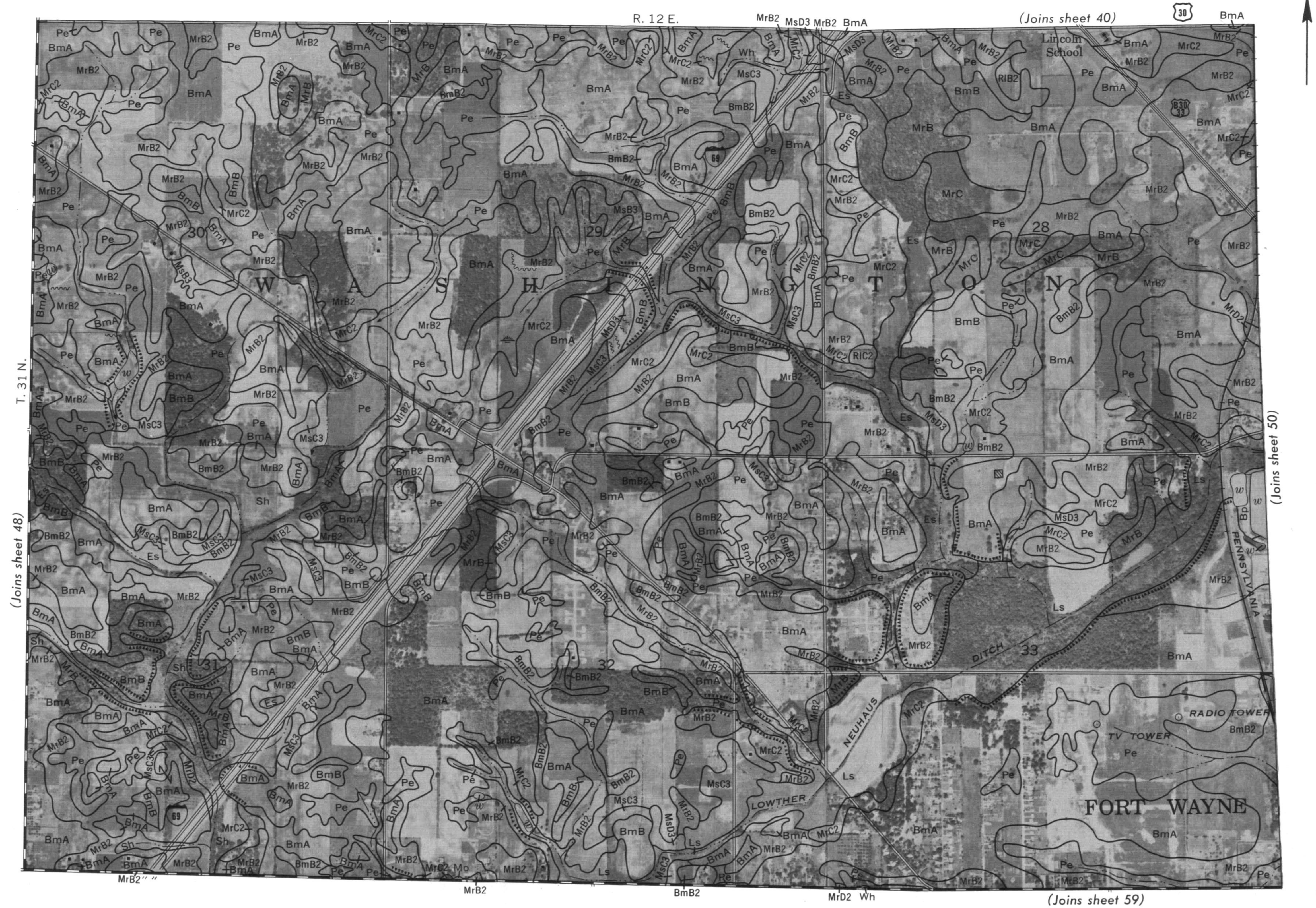
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 47



0 ½ Mile Scale 1:15 840 0 3000 Feet


N
R. 11 E.
T. 31 N.
(Joins sheet 39)
(Joins sheet 47)
(Joins sheet 49)
(Joins sheet 58)
L A K E
25
26
27
34
35
36
SEEGAR DITCH
PENNSYLVANIA
0
½ Mile
Scale 1:15 840
0
3000 Feet



This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 49

0 ½ Mile Scale 1:15 840 0 3000 Feet

ALLEN COUNTY, INDIANA — SHEET NUMBER 50

N

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 51

0 ½ Mile Scale 1:15 840 0 3000 Feet

0 ½ Mile Scale 1:15 840 0 3000 Feet

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA — SHEET NUMBER 54

0 ½ Mile Scale 1:15 840 0 3000 Feet

ALLEN COUNTY, INDIANA NO. 54

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

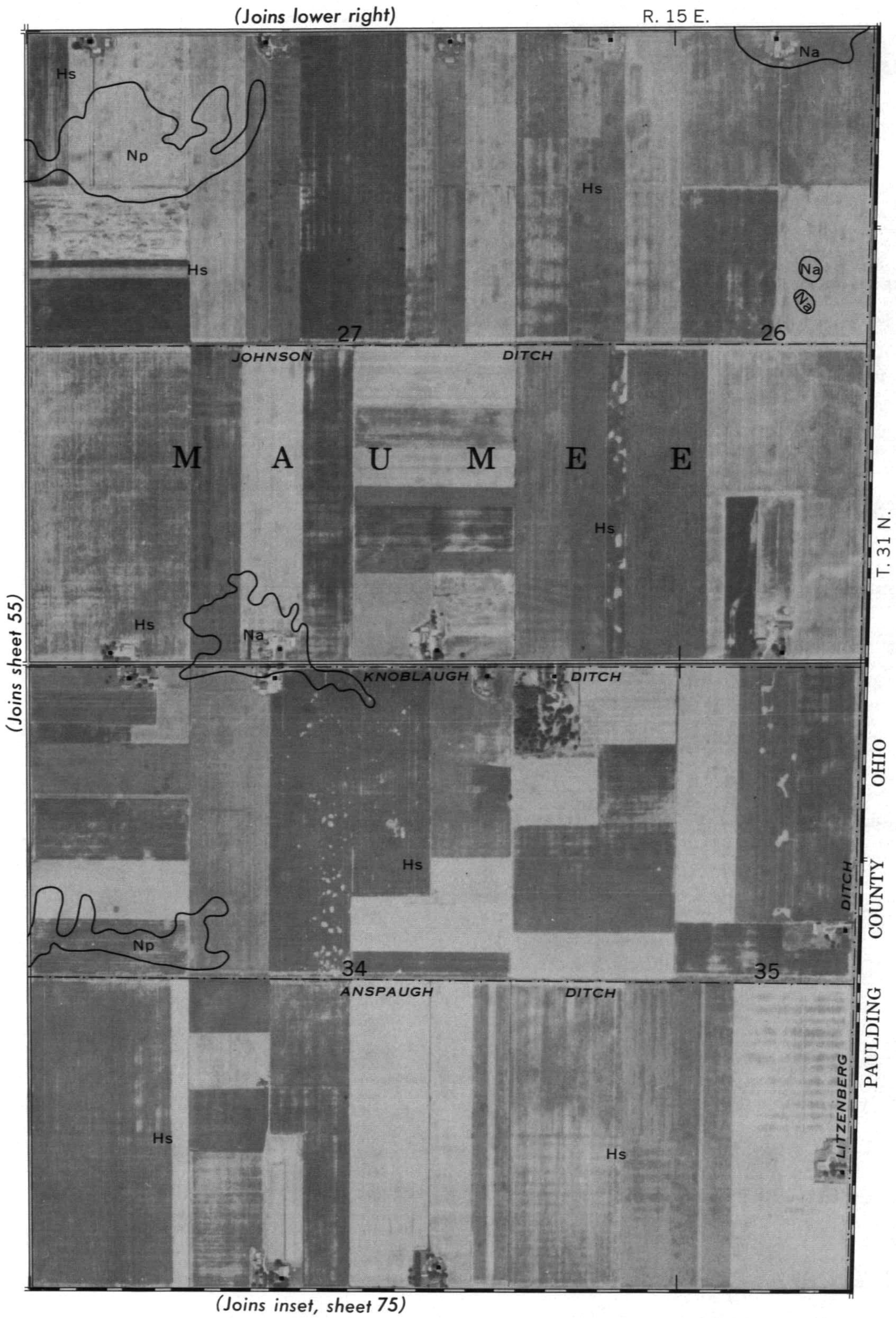
ALLEN COUNTY, INDIANA NO. 55

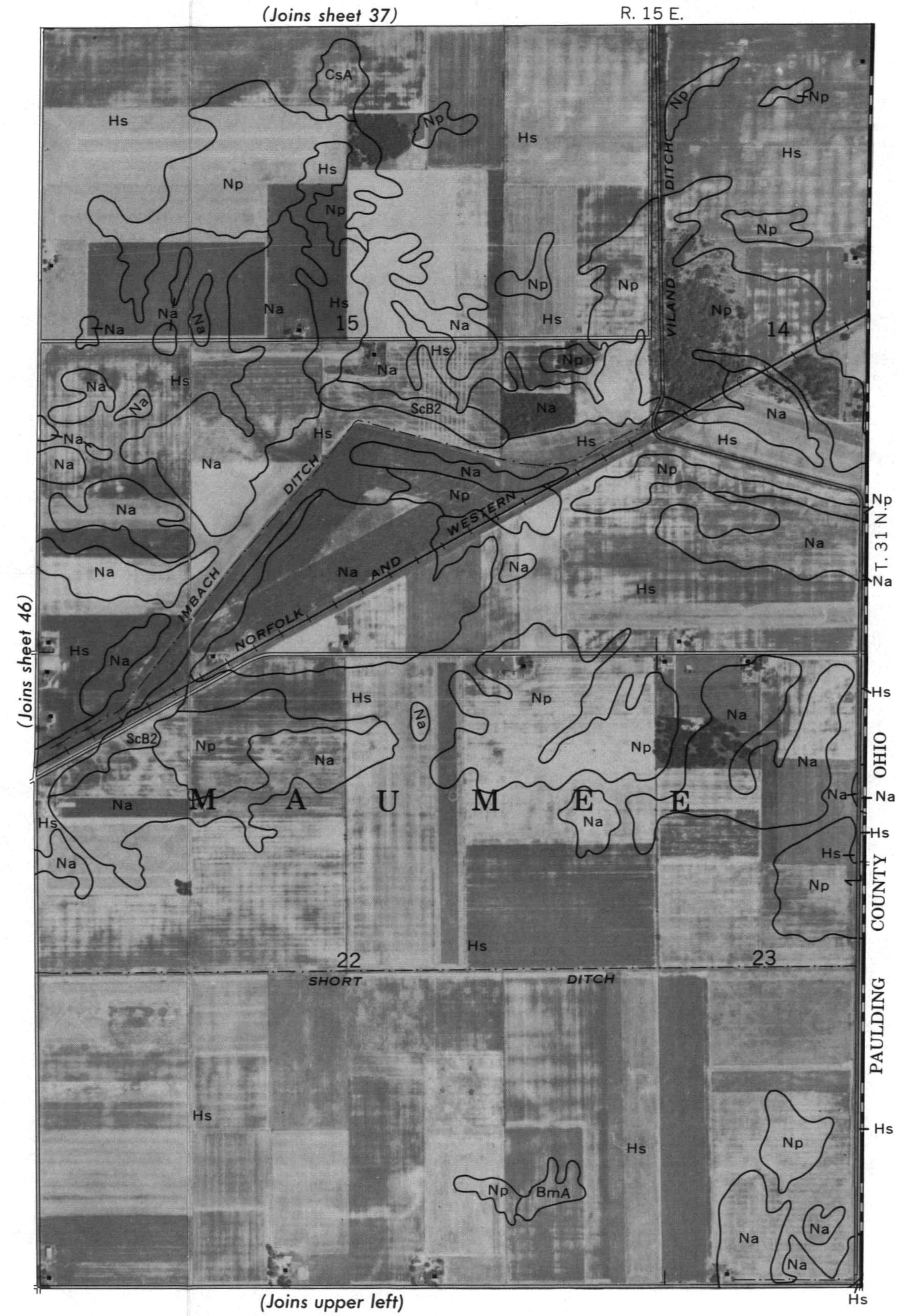
N

0 ½ Mile Scale 1:15 840 0 3000 Feet

ALLEN COUNTY, INDIANA — SHEET NUMBER 56

N





0 ½ Mile Scale 1:15 840 0 3000 Feet

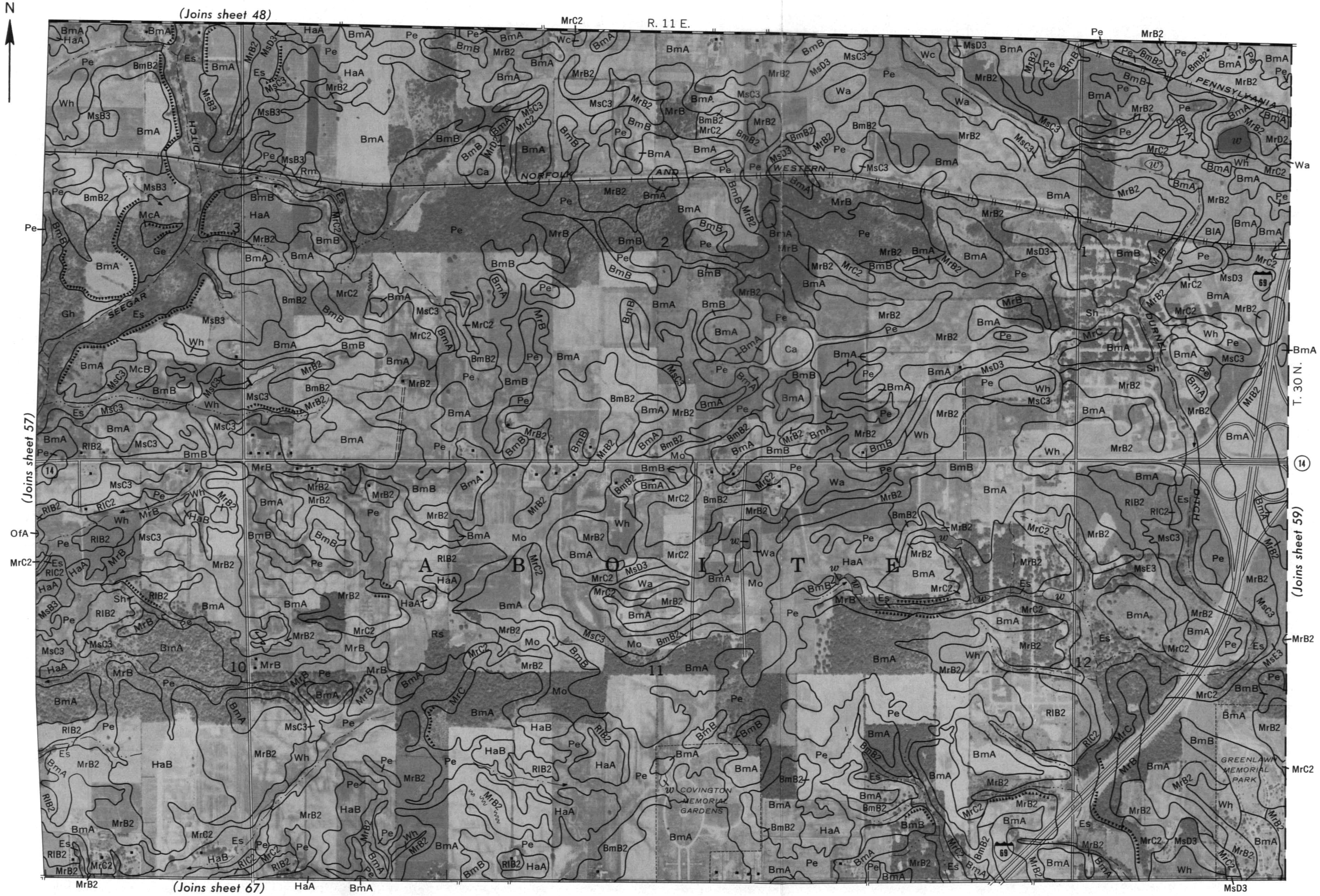
ALLEN COUNTY, INDIANA NO. 57

Land division corners are approximately positioned on this map.

* This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.

0 ½ Mile Scale 1:15 840 0 3000 Feet

ALLEN COUNTY, INDIANA — SHEET NUMBER 58



0 ½ Mile Scale 1:15 840 0 3000 Feet

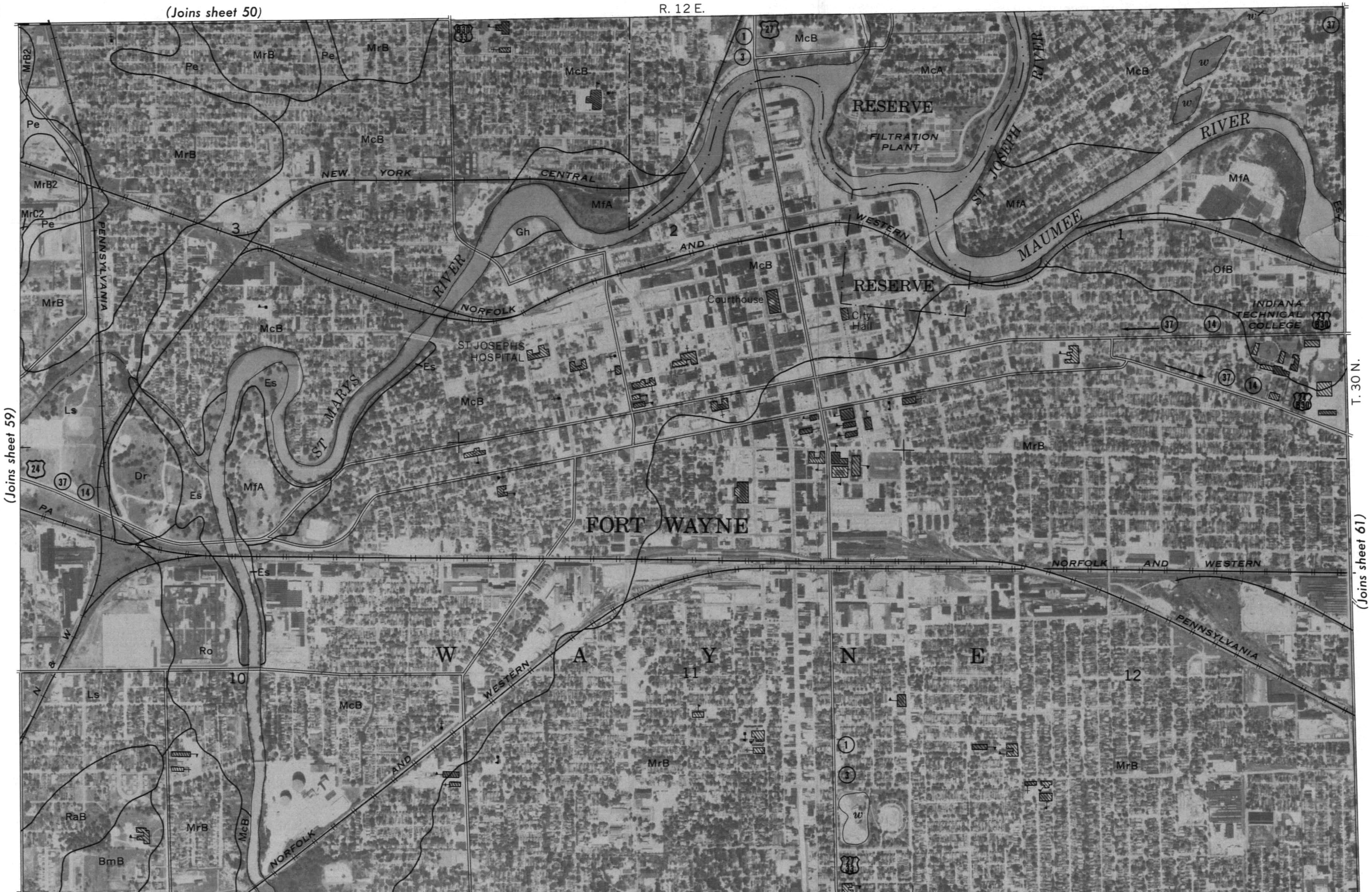
0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 59

ALLEN COUNTY, INDIANA — SHEET NUMBER 60

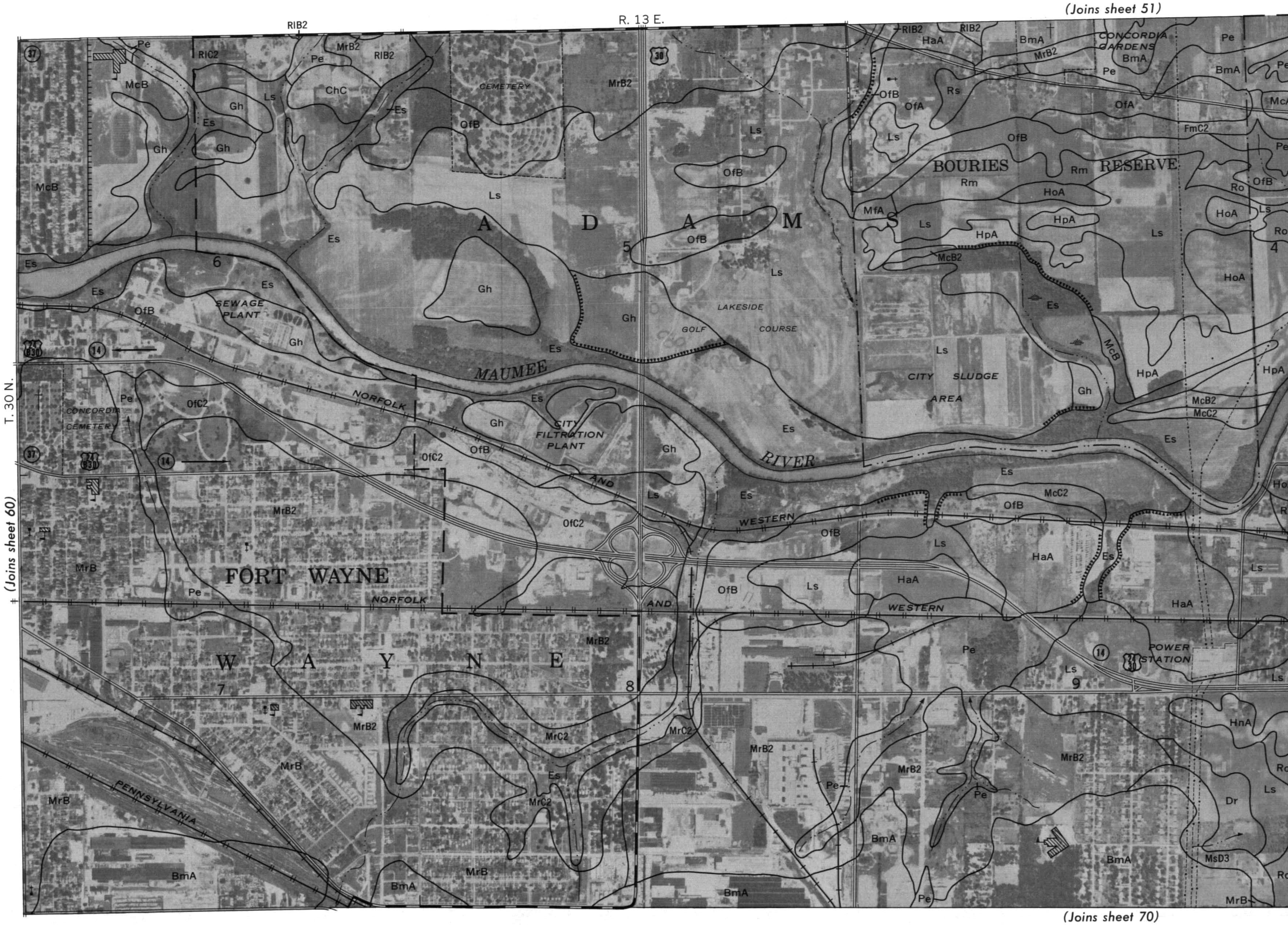
N



0 ½ Mile Scale 1:15 840 0 3000 Feet

*This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 61

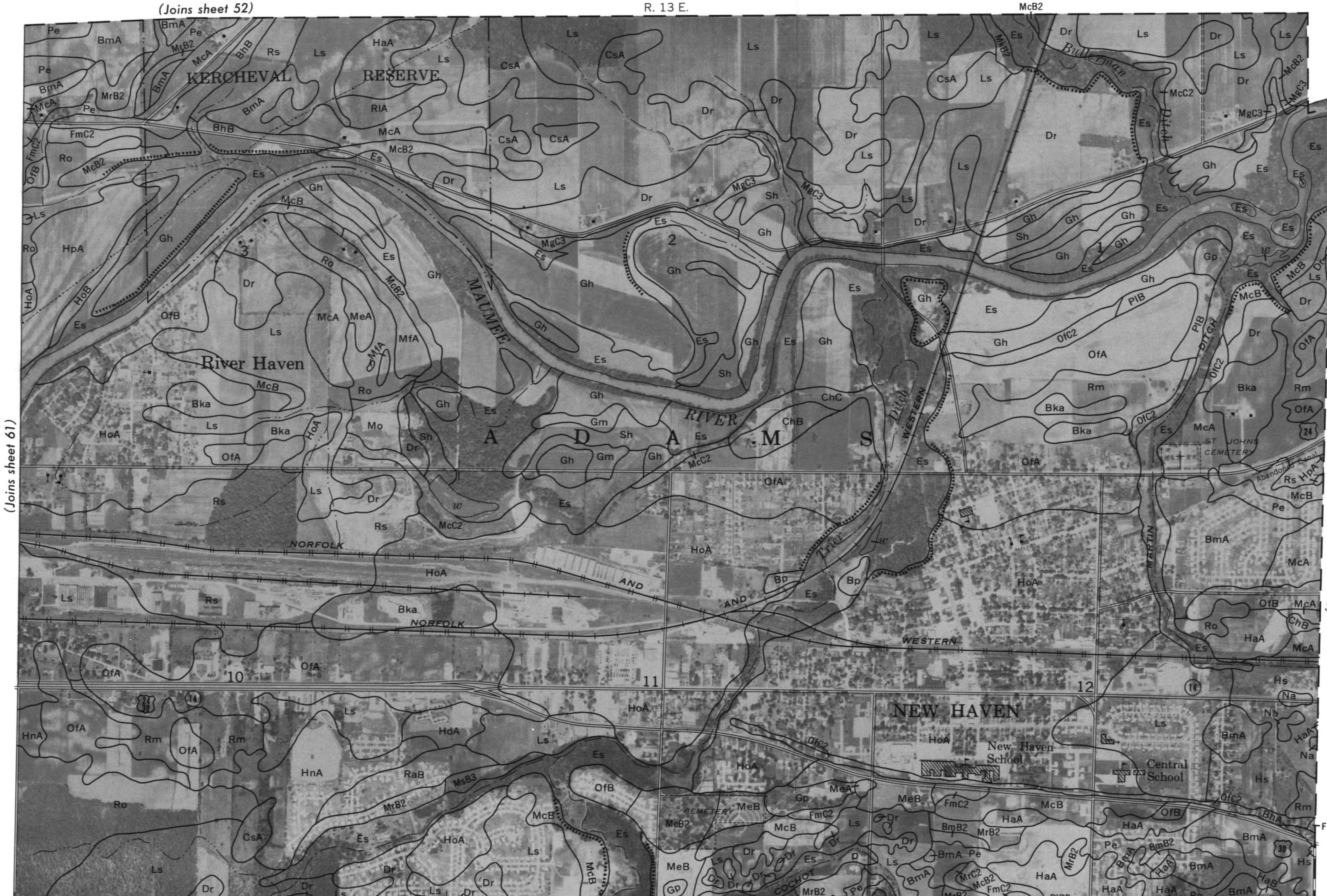


0 ½ Mile Scale 1:15 840 0 3000 Feet

N

(Joins sheet 52)

R. 13 E.



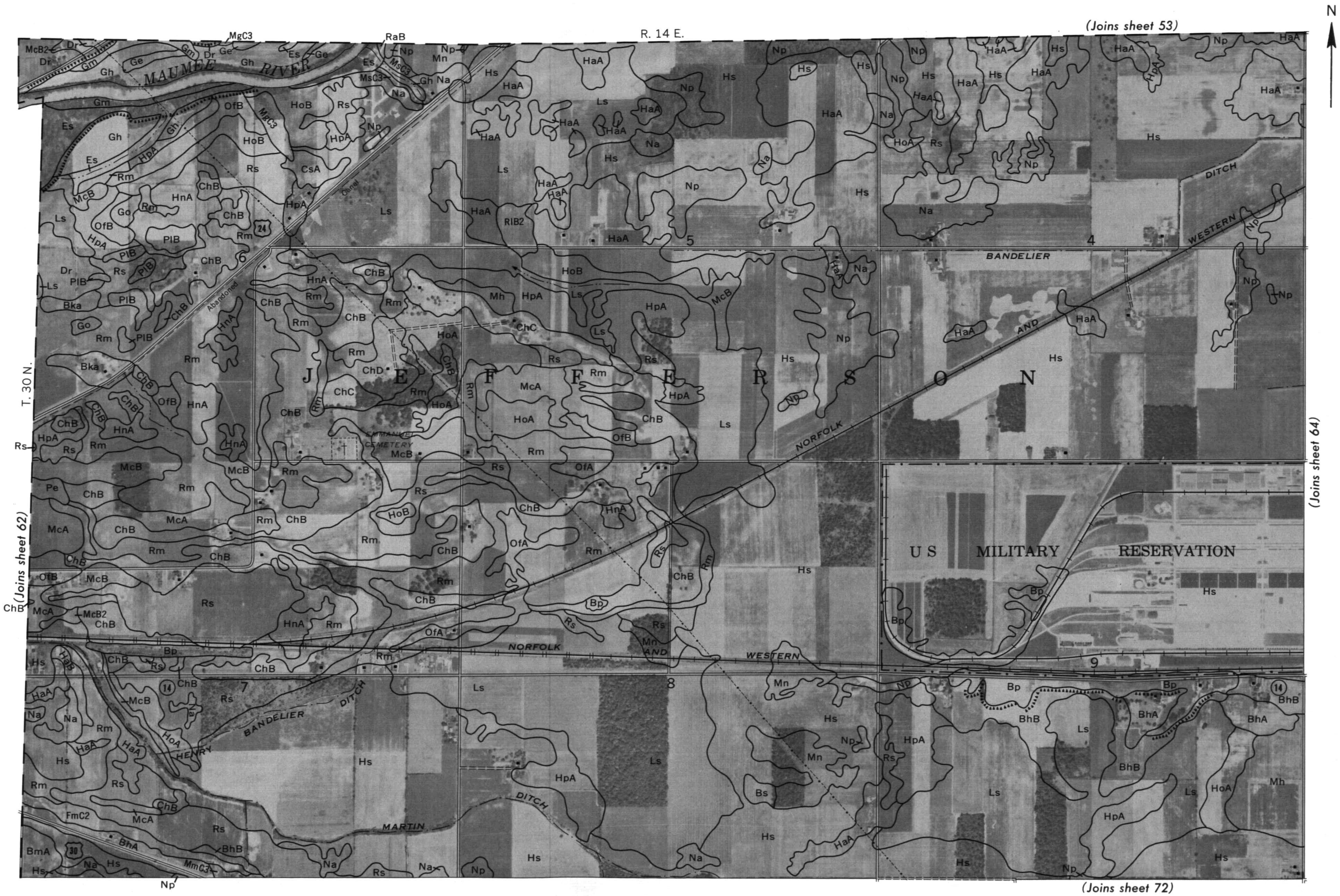
(Joins sheet 61)

T. 30 N.

(Joins sheet 63)

(Joins sheet 71)

0 ½ Mile Scale 1:15 840 0 3000 Feet



0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA — SHEET NUMBER 64

N

(Joins sheet 54)

(Joins sheet 63)

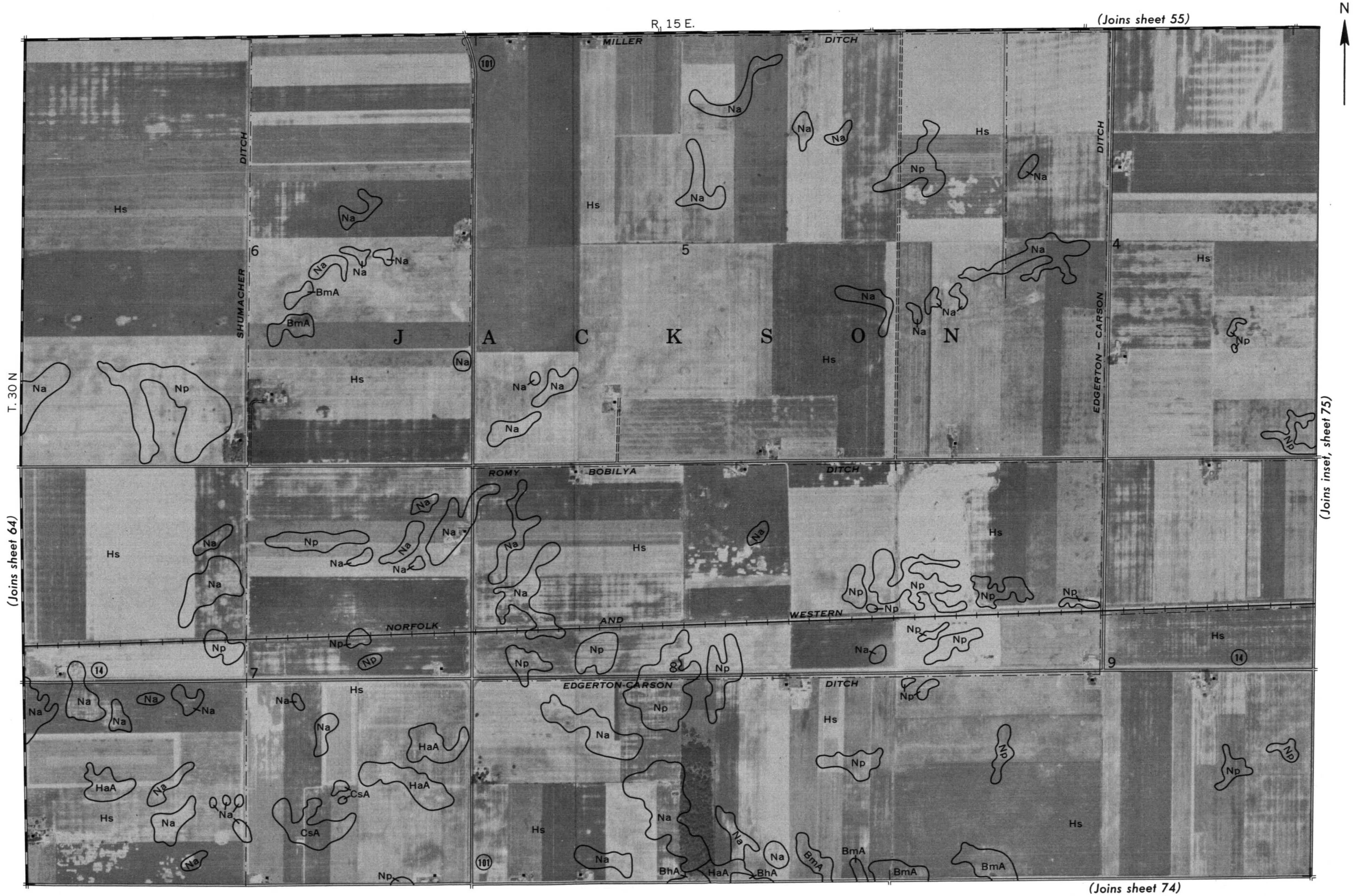
(Joins sheet 65)

(Joins sheet 73)

0 ½ Mile

Scale 1:15 840

0 3000 Feet



0 ½ Mile Scale 1:15 840 0 3000 Feet

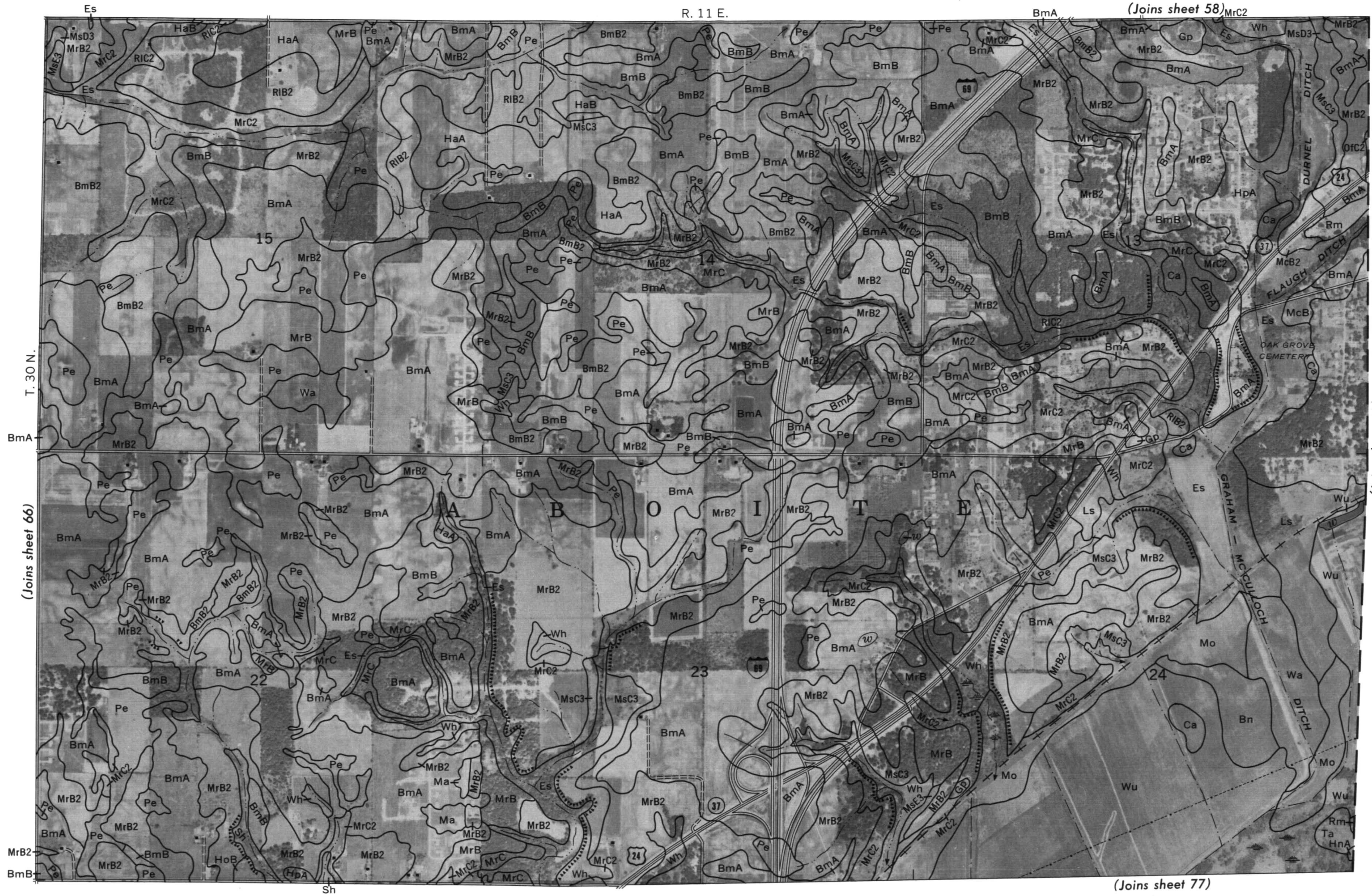
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO.65

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station. Land division corners are approximately positioned on this map.

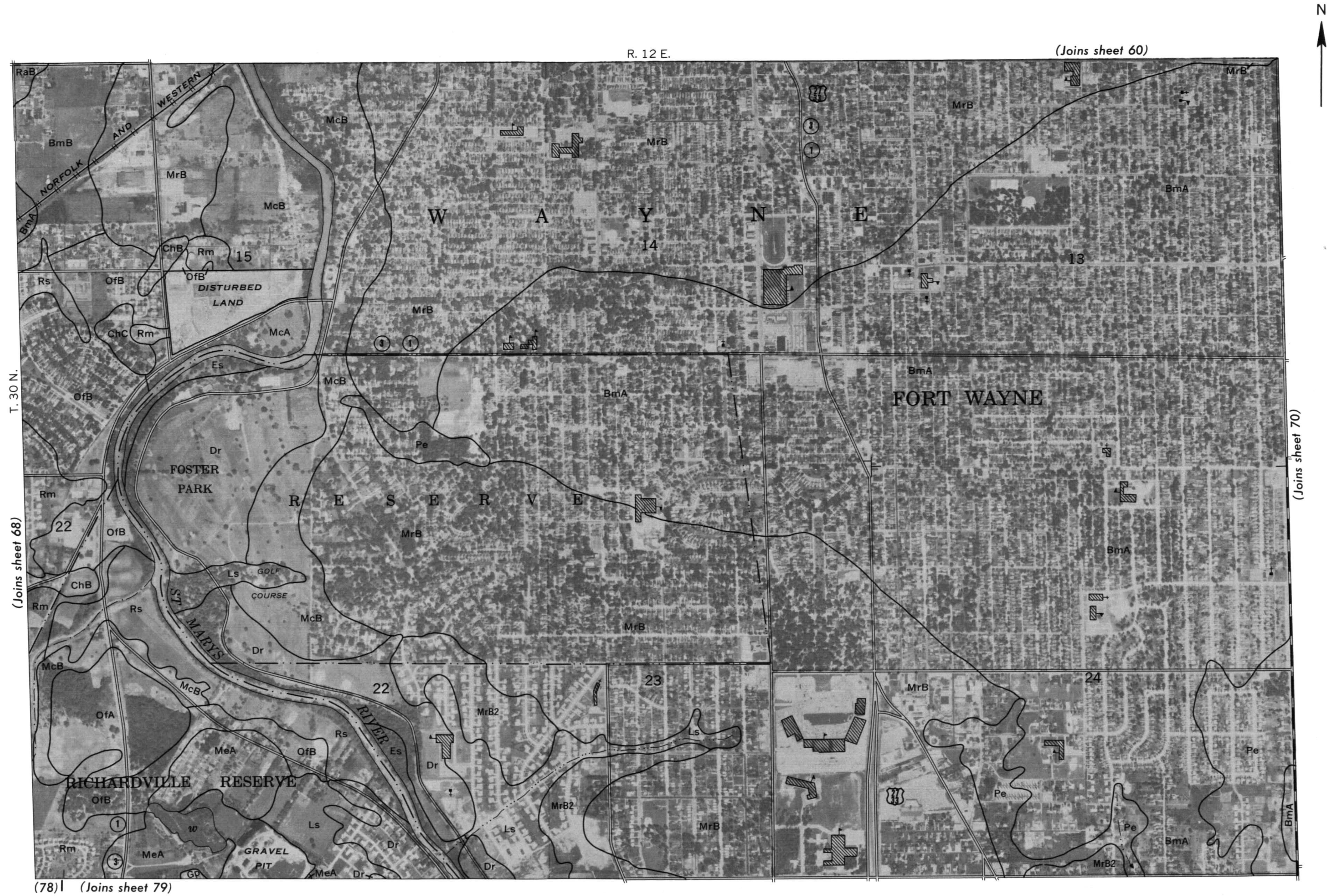
ALLEN COUNTY, INDIANA NO. 67



0 ½ Mile Scale 1:15 840 0 3000 Feet

ALLEN COUNTY, INDIANA — SHEET NUMBER 68

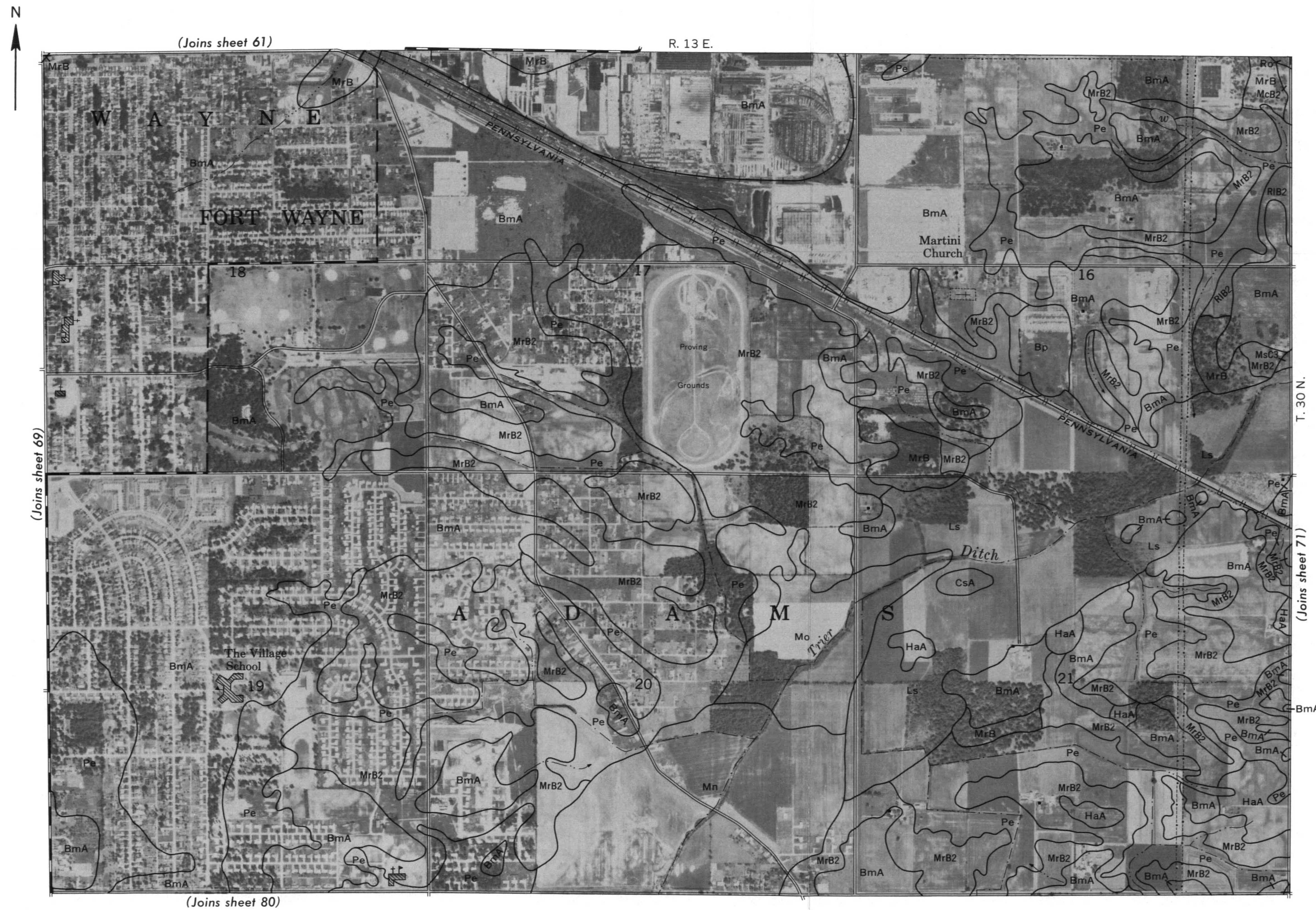
0 ½ Mile Scale 1:15 840 0 3000 Feet



0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

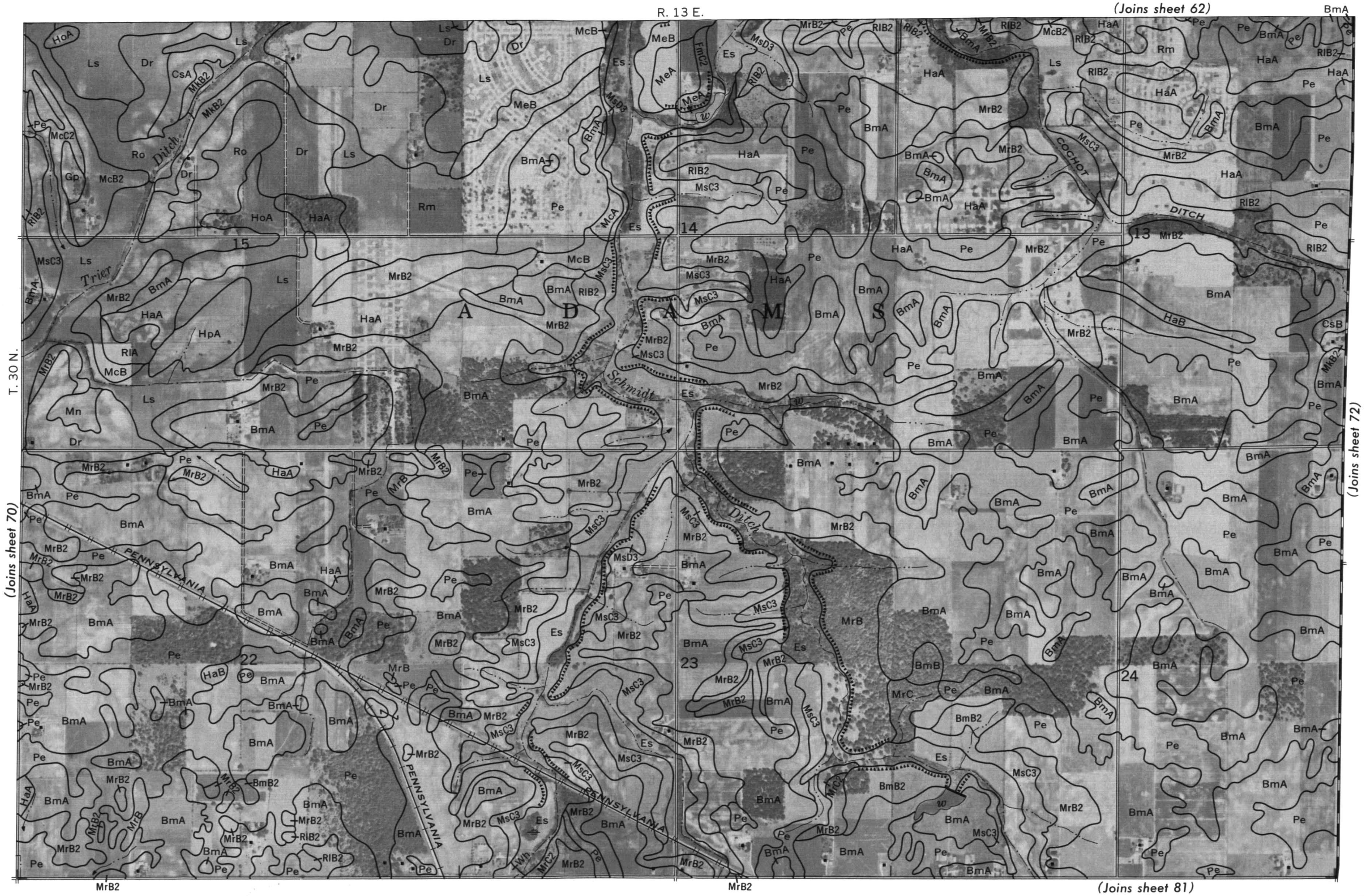
ALLEN COUNTY, INDIANA NO.69



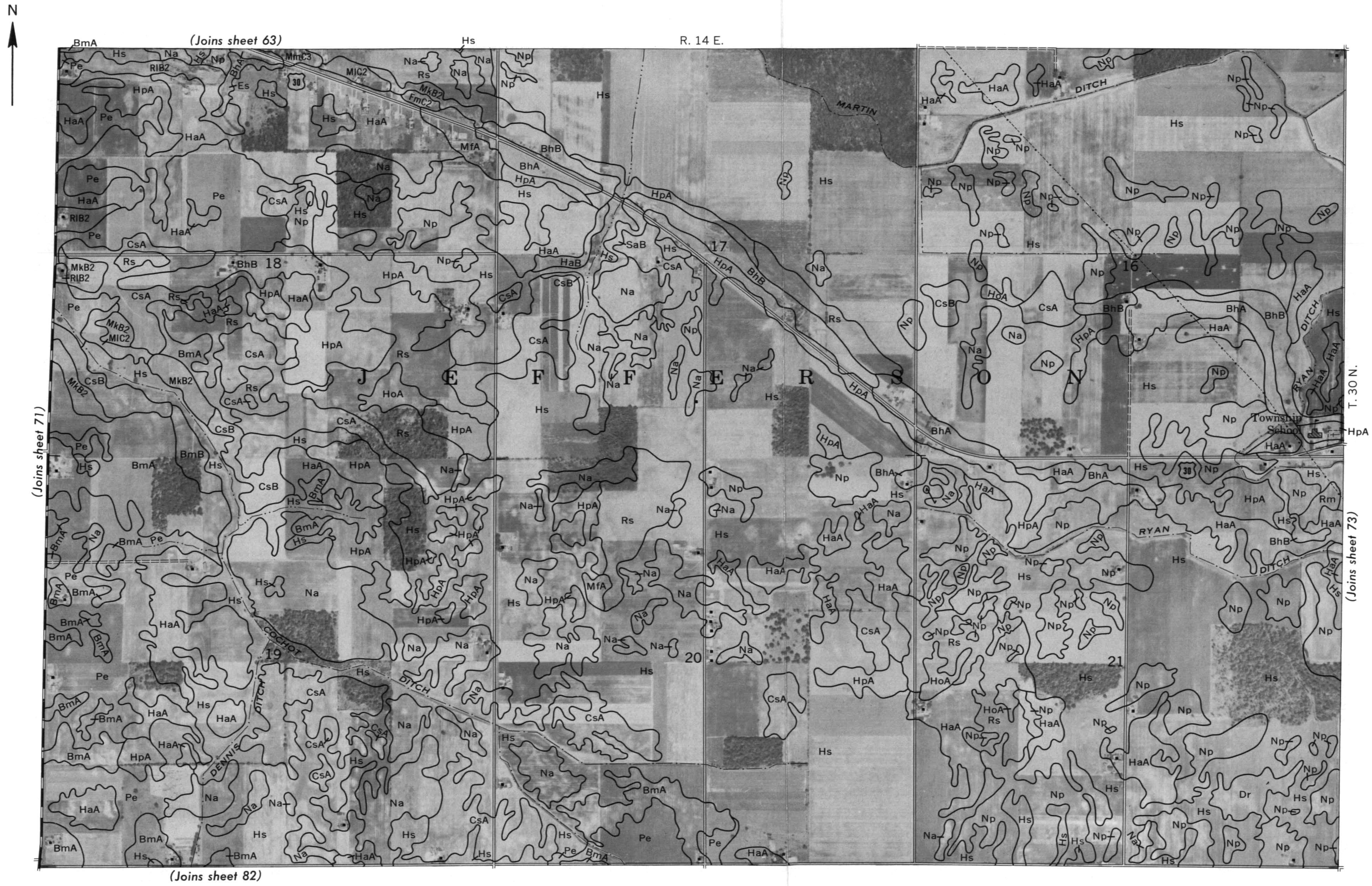
0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 71



0 ½ Mile Scale 1:15 840 0 3000 Feet



0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 73

N

0 ½ Mile Scale 1:15 840 0 3000 Feet

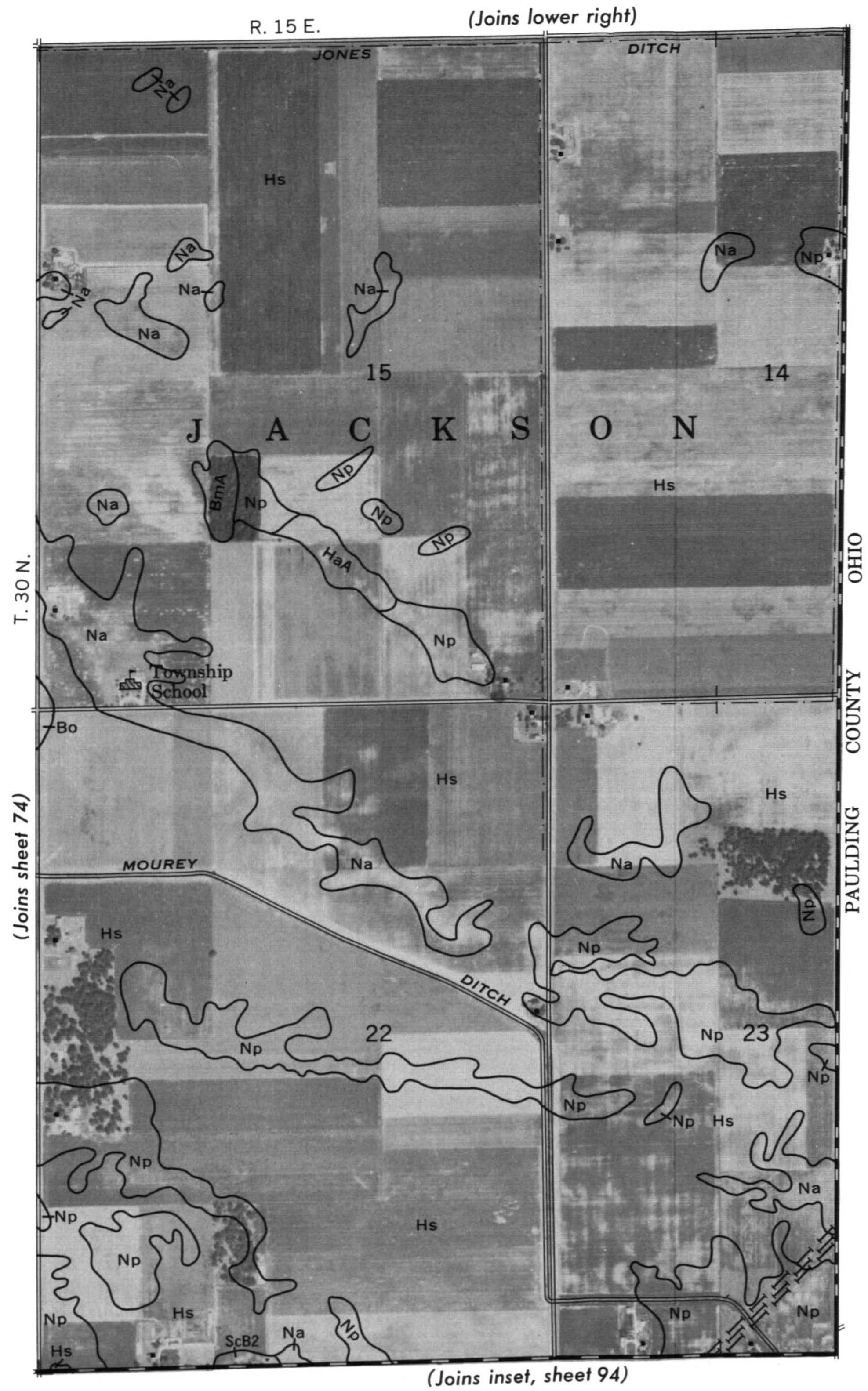
ALLEN COUNTY, INDIANA — SHEET NUMBER 74

74

ALLEN COUNTY, INDIANA NO.74

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

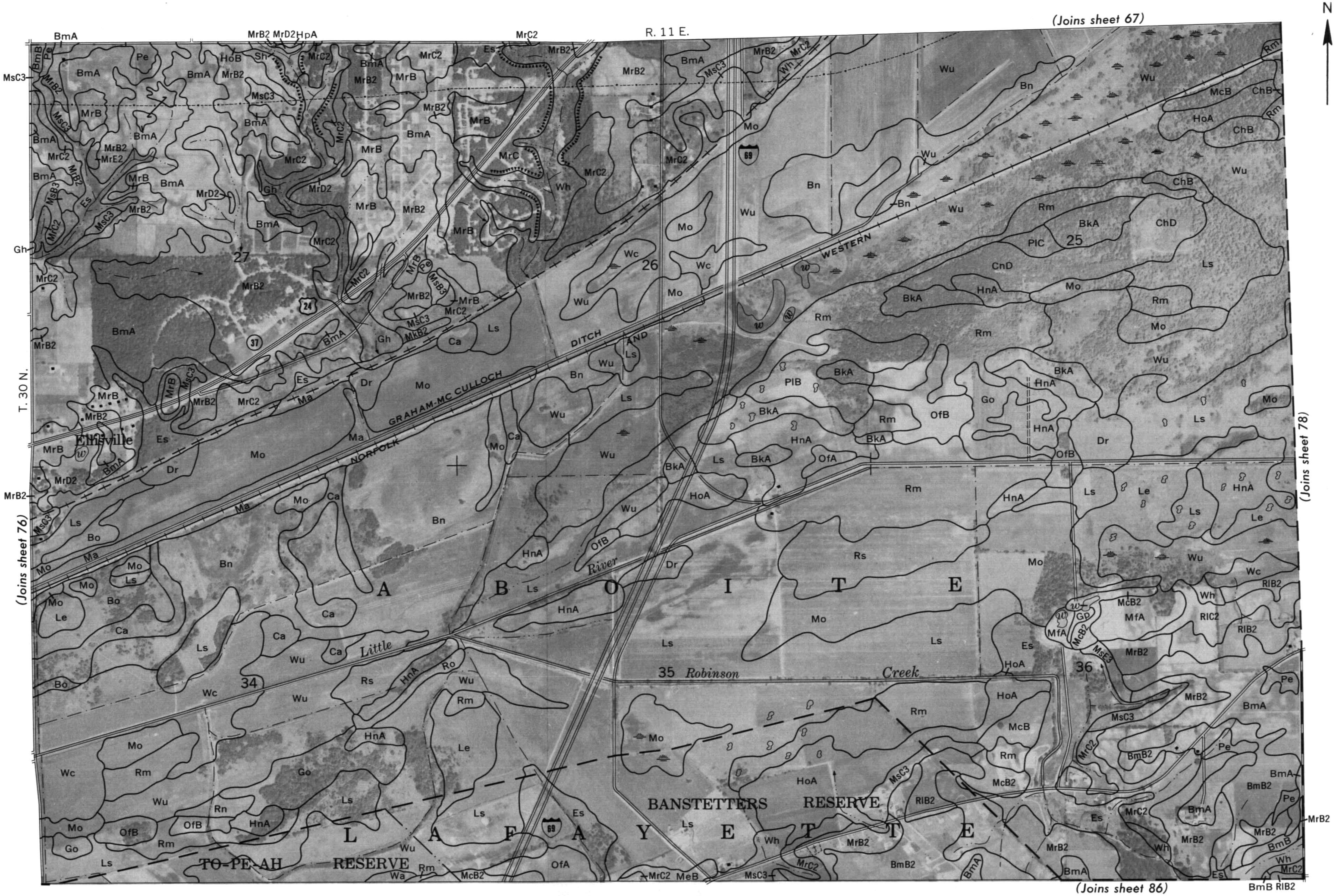
ALLEN COUNTY, INDIANA NO. 75



0 ½ Mile Scale 1:15 840 0 3000 Feet

76

Scale 1:15 840 — 0 ½ Mile — 0 3000 Feet



0 ½ Mile Scale 1:15 840 0 3000 Feet

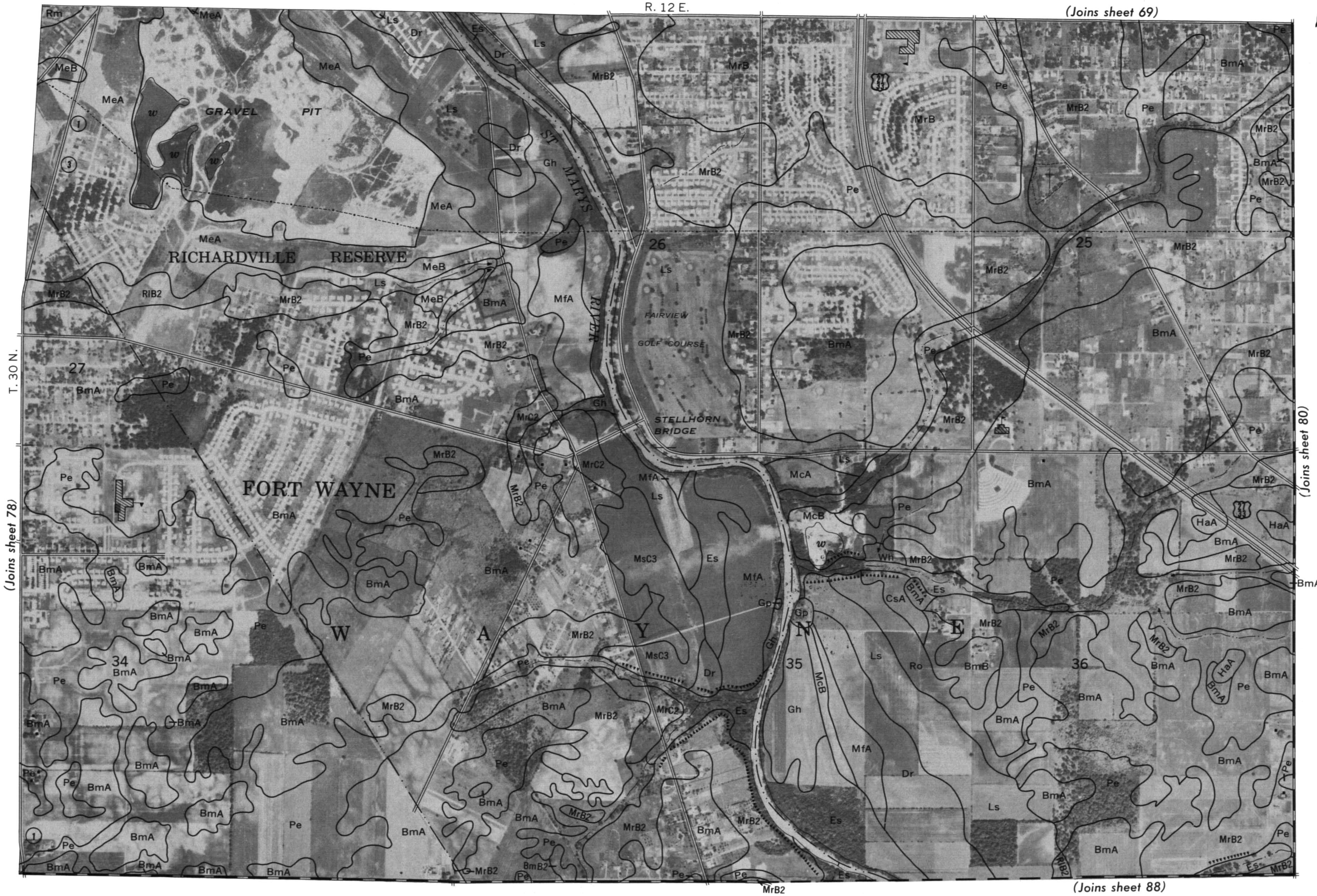
This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

N

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 79



0 ½ Mile Scale 1:15 840 0 3000 Feet

N

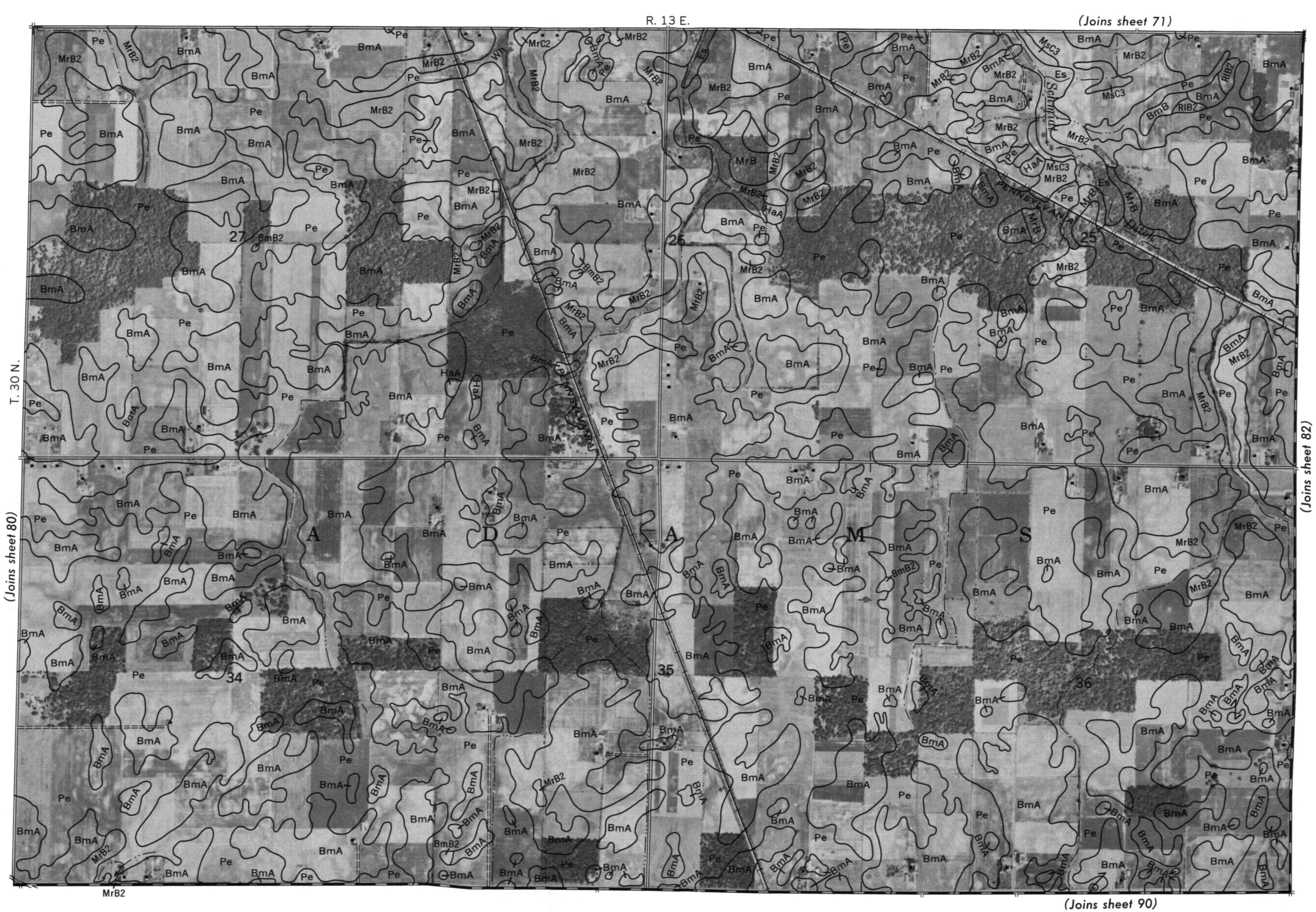
(Joins sheet 70)

(Joins sheet 79)

(Joins sheet 81)

(Joins sheet 89)

0 ½ Mile Scale 1:15 840 0 3000 Feet



0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 81

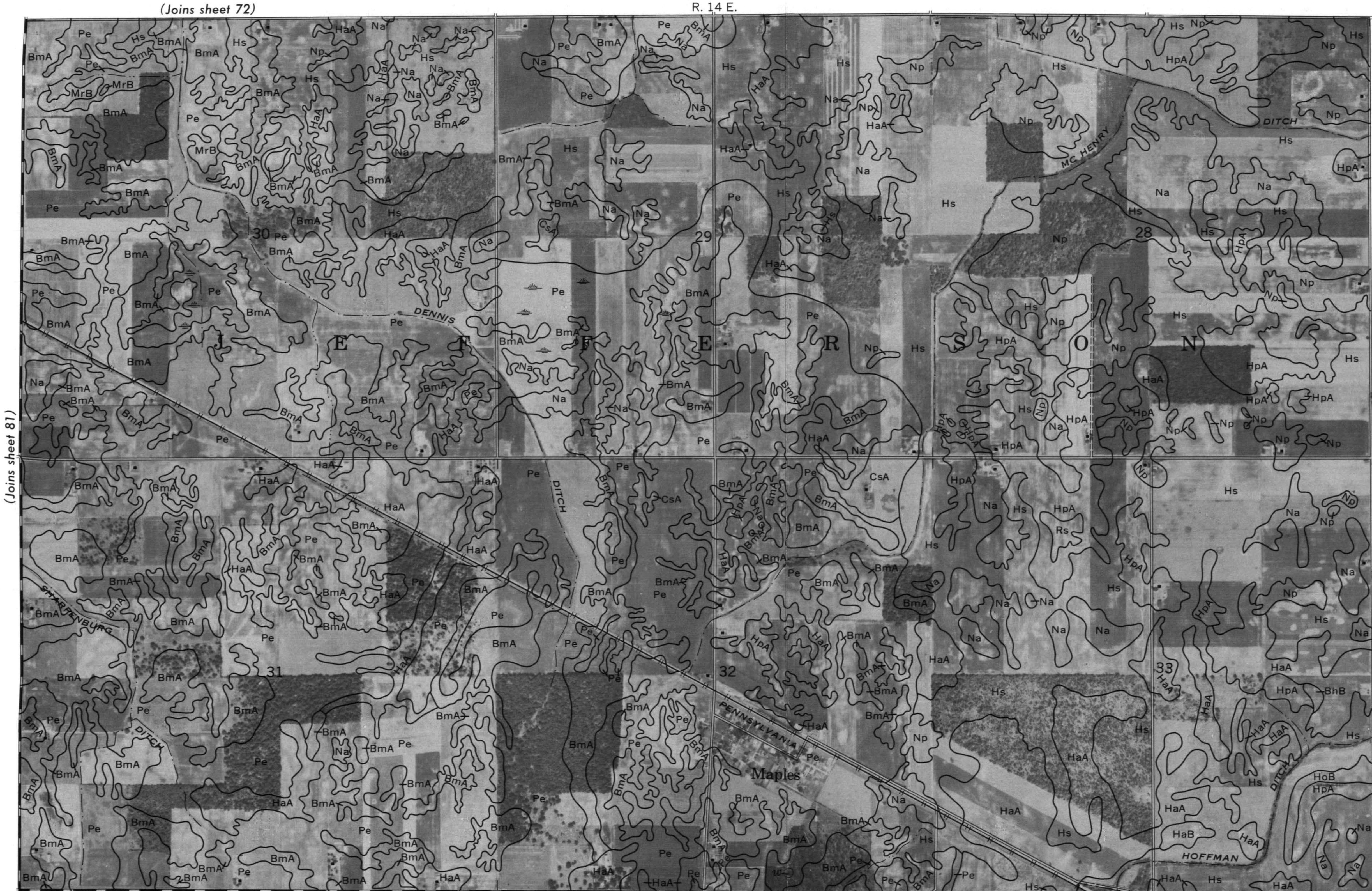
ALLEN COUNTY, INDIANA — SHEET NUMBER 82

N

(Joins sheet 72)

R. 14 E.

(Joins sheet 81)



T. 30 N.

(Joins sheet 83)

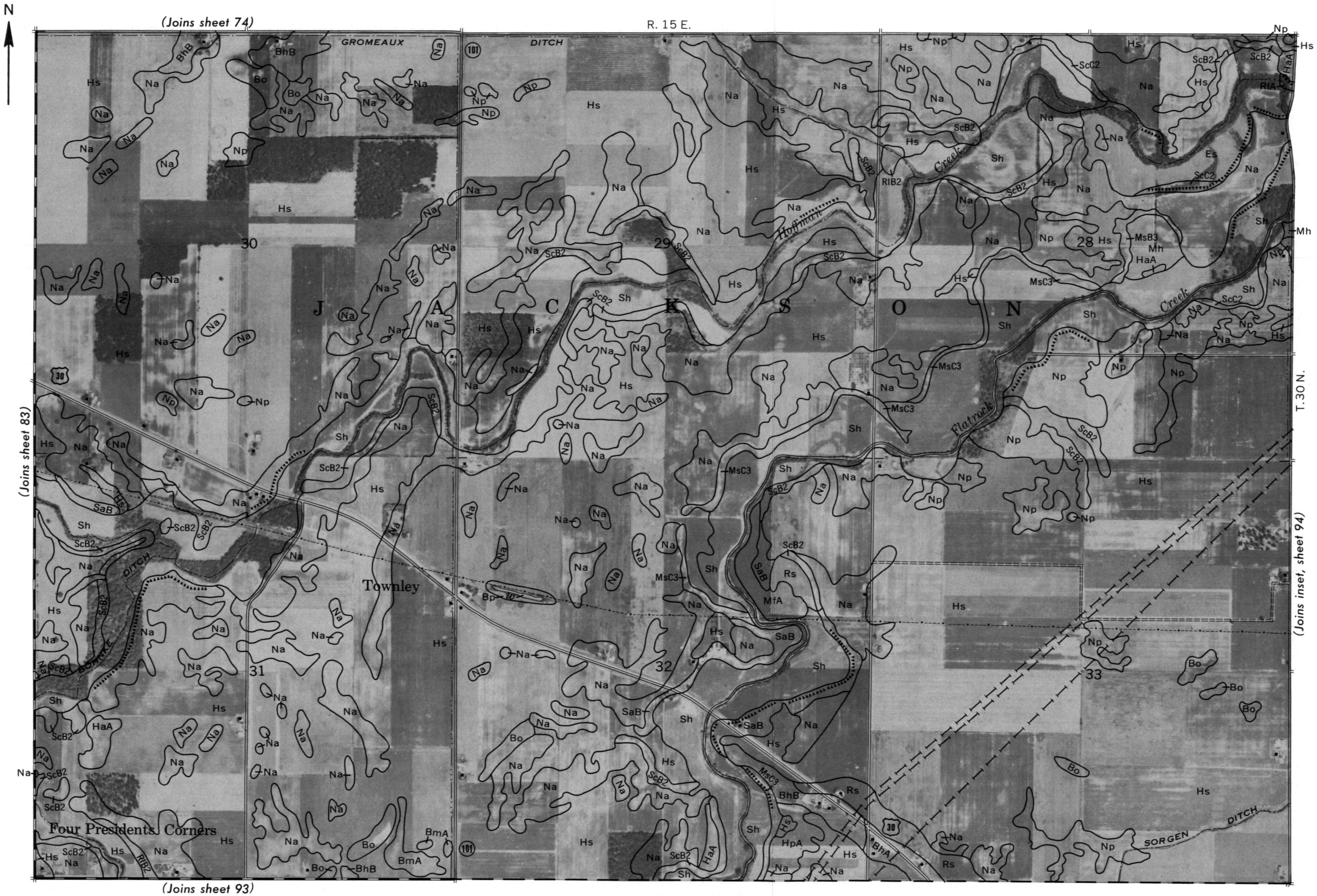
(Joins sheet 91) | (92)

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 83

0 ½ Mile Scale 1:15 840 0 3000 Feet

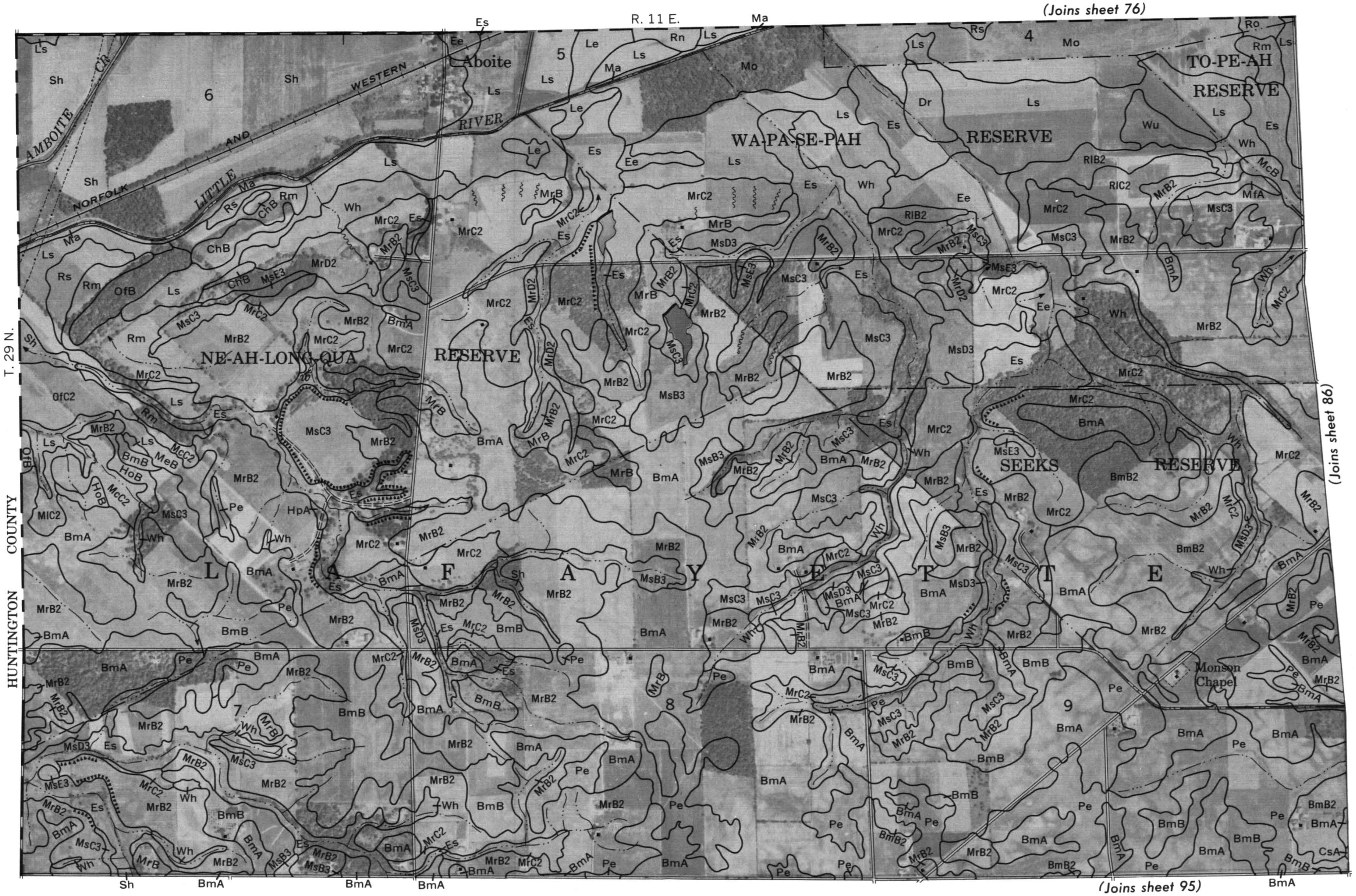


0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station
Land division corners are approximately positioned on this map.

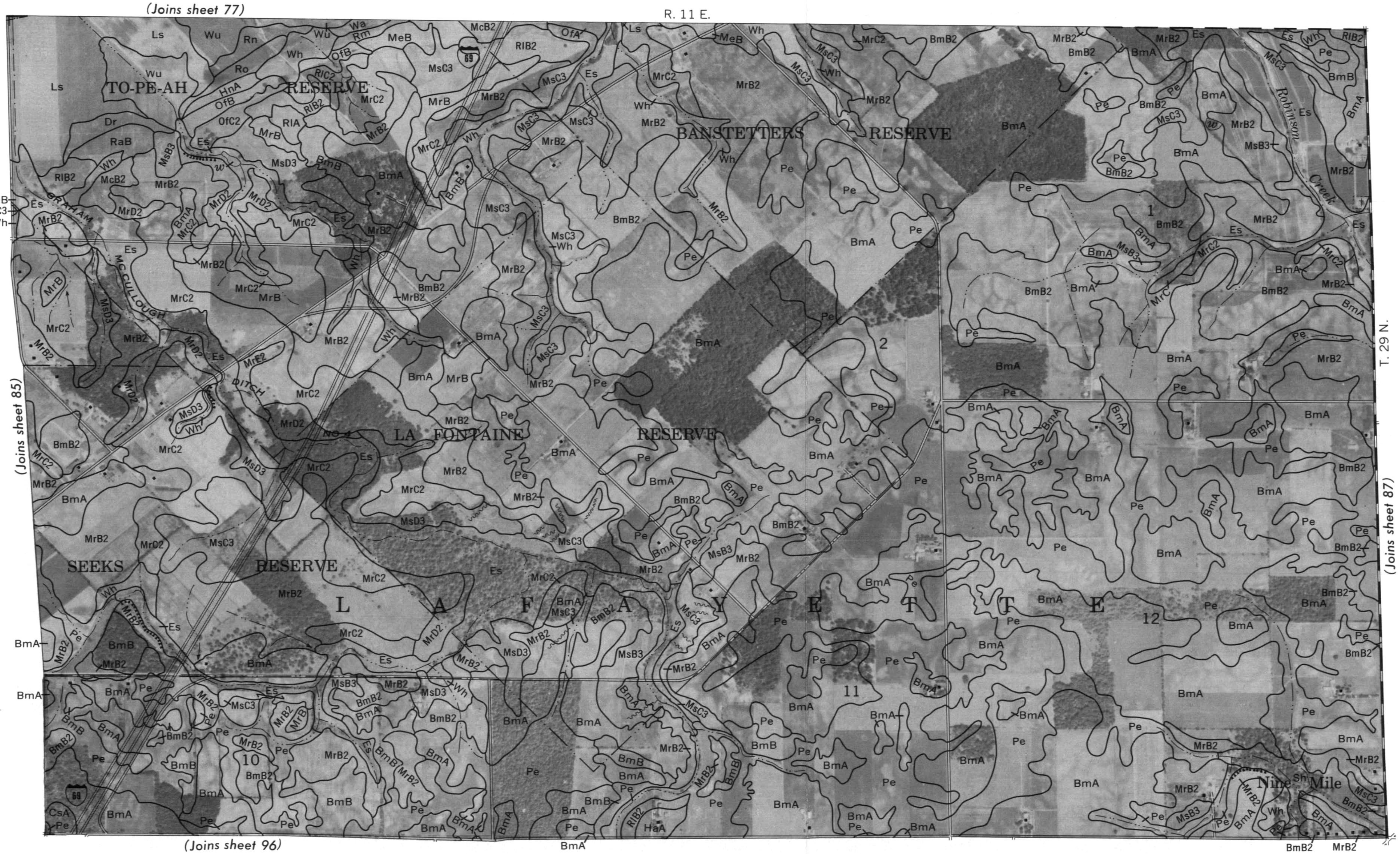
ALLEN COUNTY, INDIANA NO. 85

N



0 ½ Mile Scale 1:15 840 0 3000 Feet

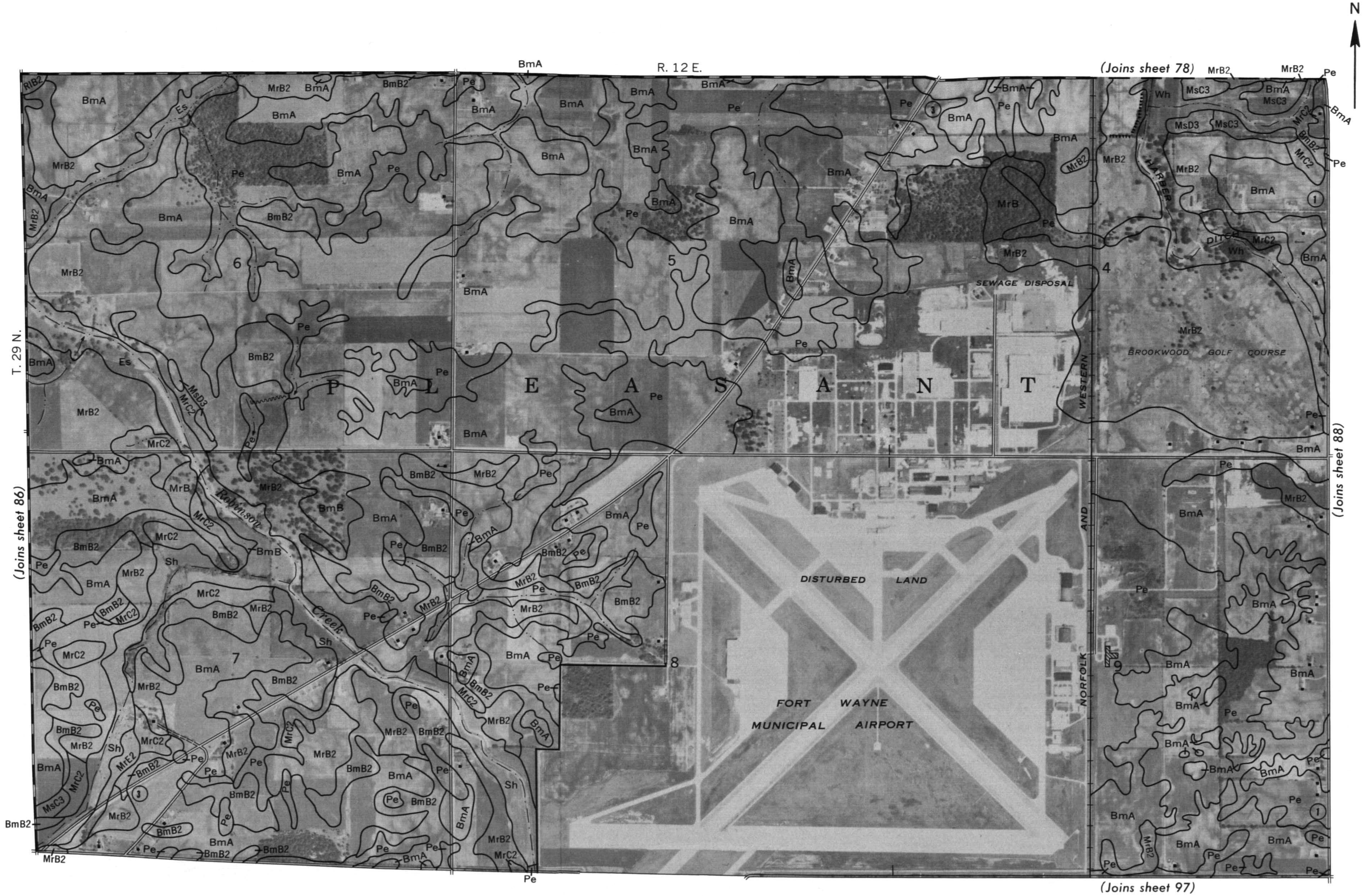
N



0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 87

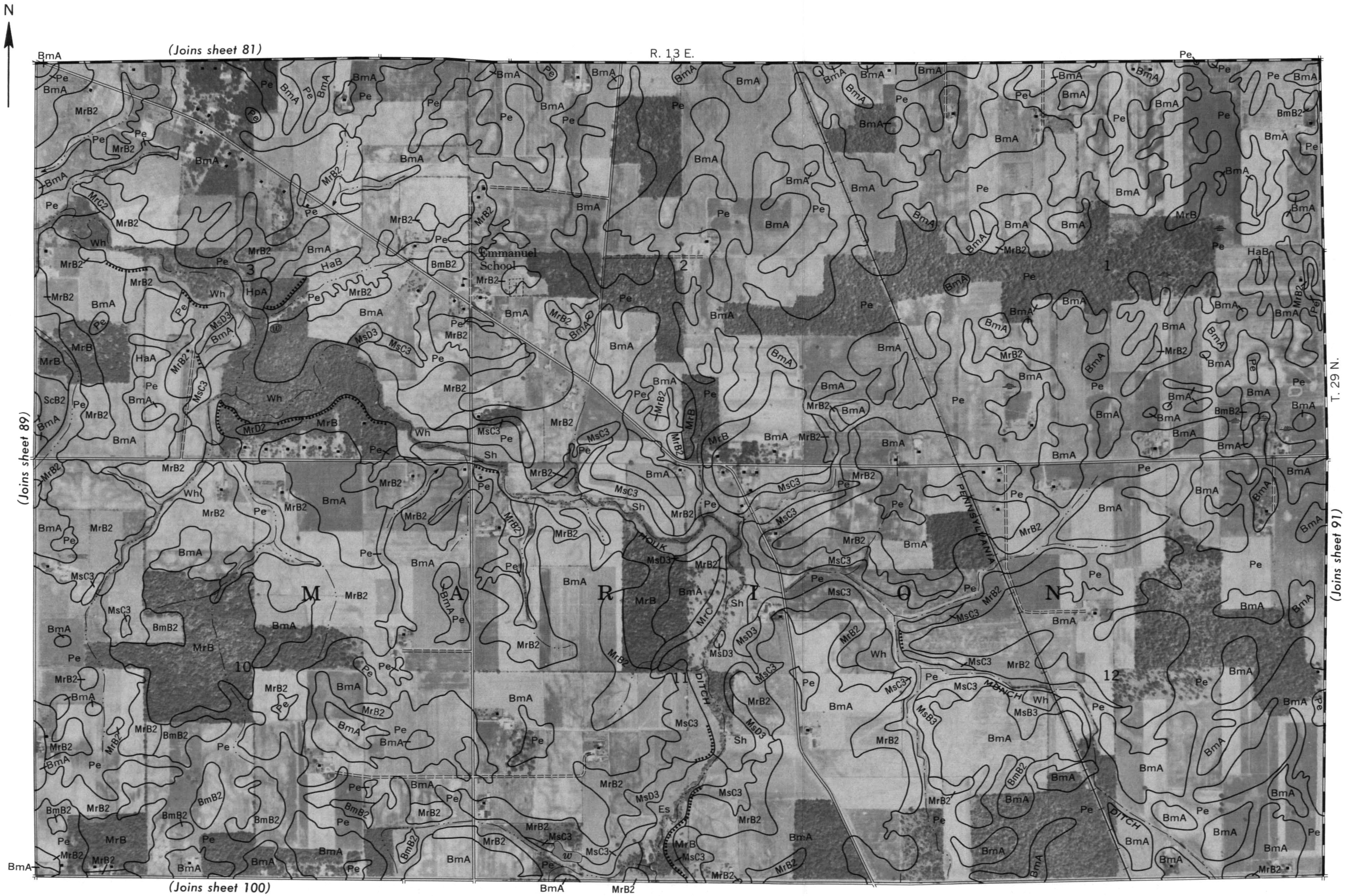


0 ½ Mile Scale 1:15 840 0 3000 Feet

0 ½ Mile Scale 1:15 840 0 3000 Feet

ALLEN COUNTY, INDIANA NO. 89

0 ½ Mile Scale 1:15 840 0 3000 Feet

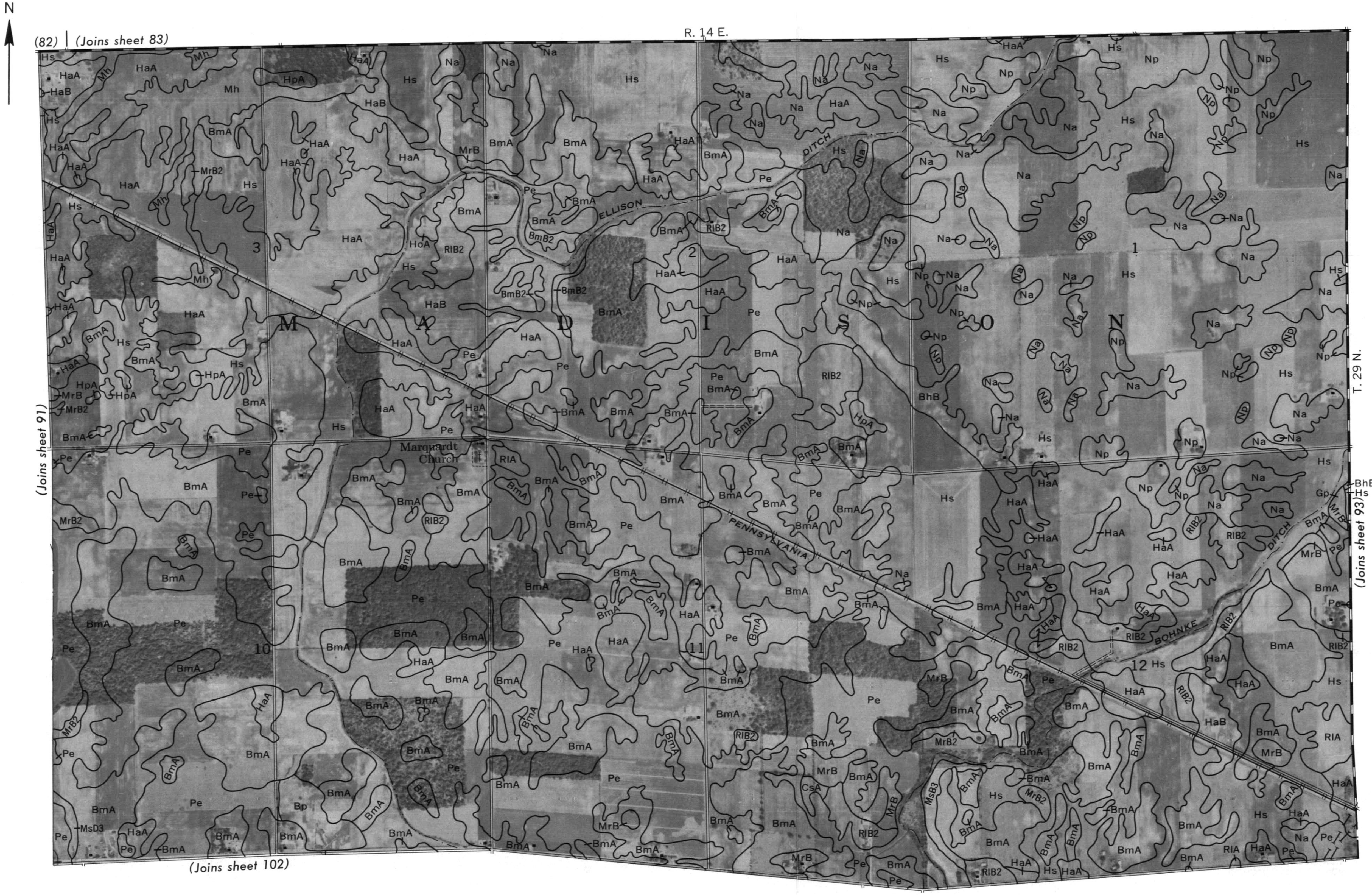


0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 91

0 ½ Mile Scale 1:15 840 0 3000 Feet



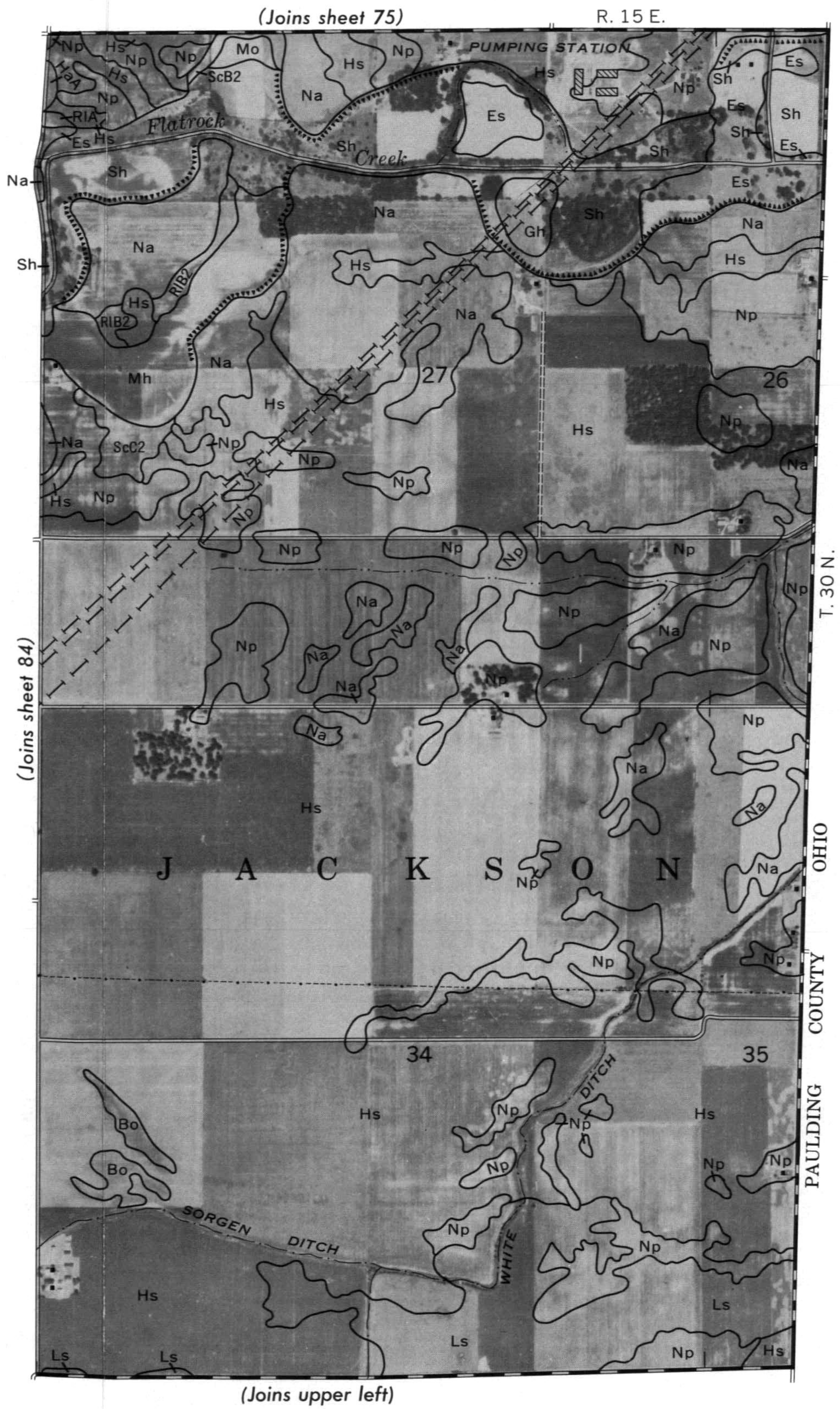
0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 93

0 ½ Mile Scale 1:15 840 0 3000 Feet

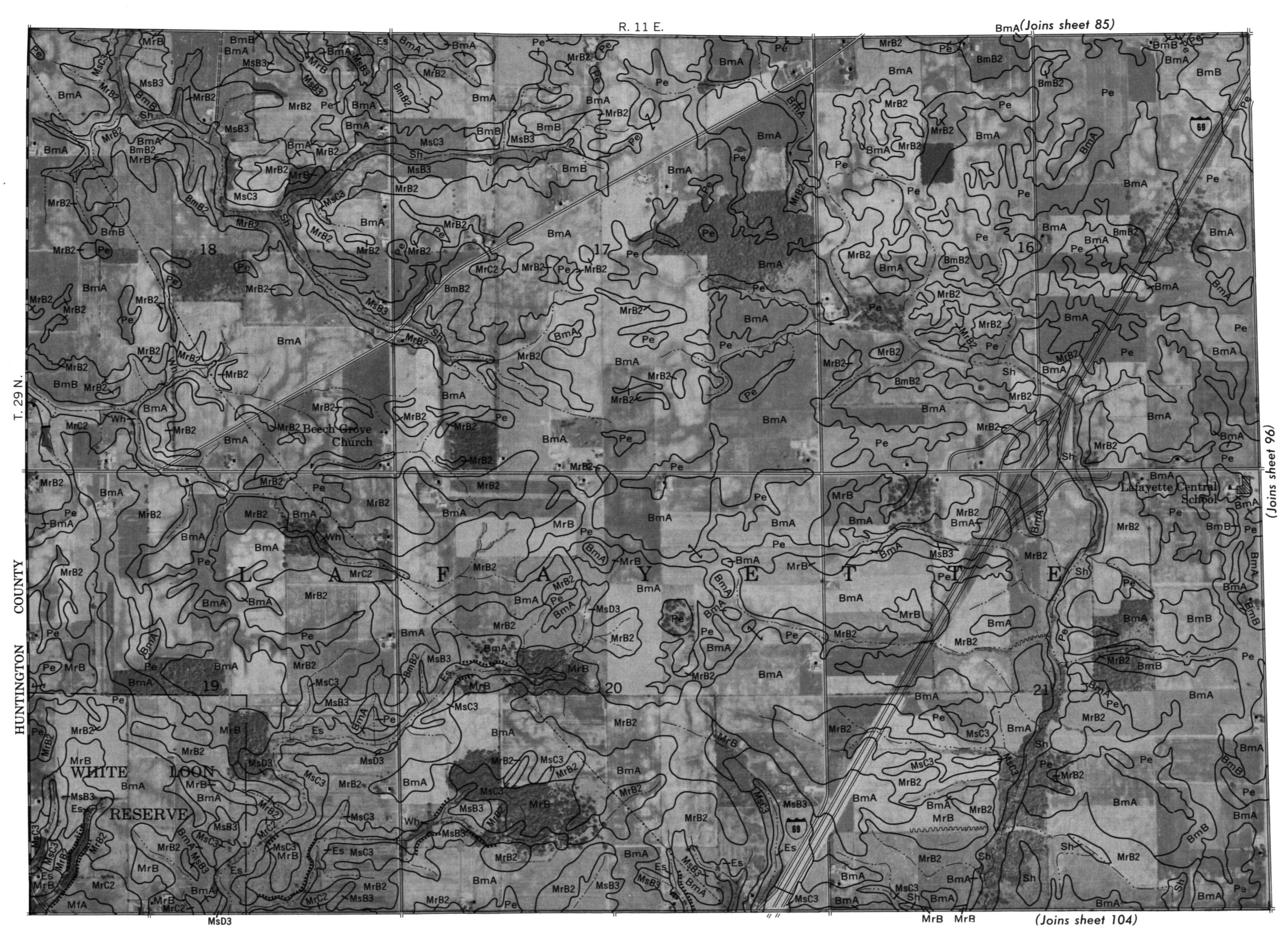
N



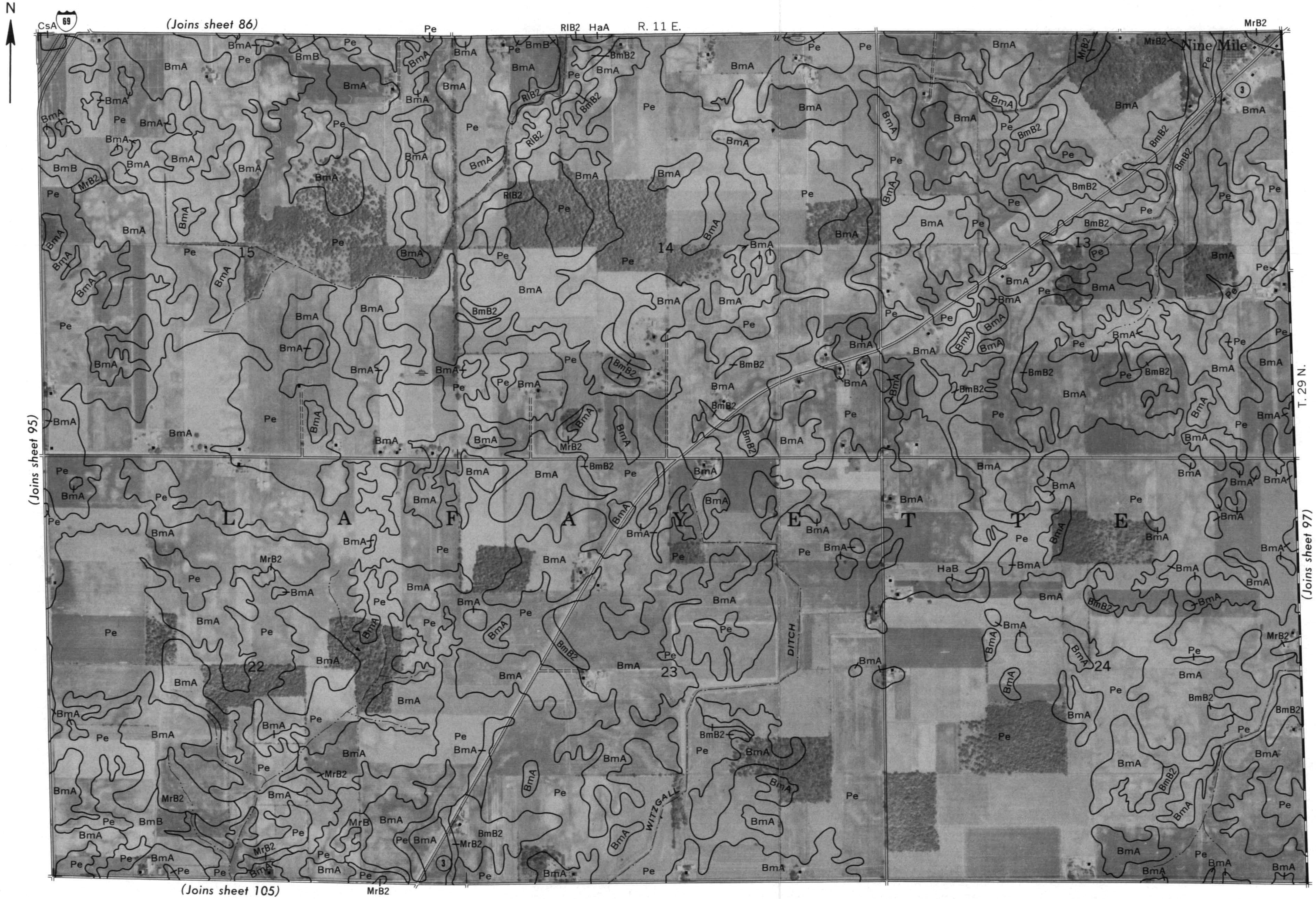
0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

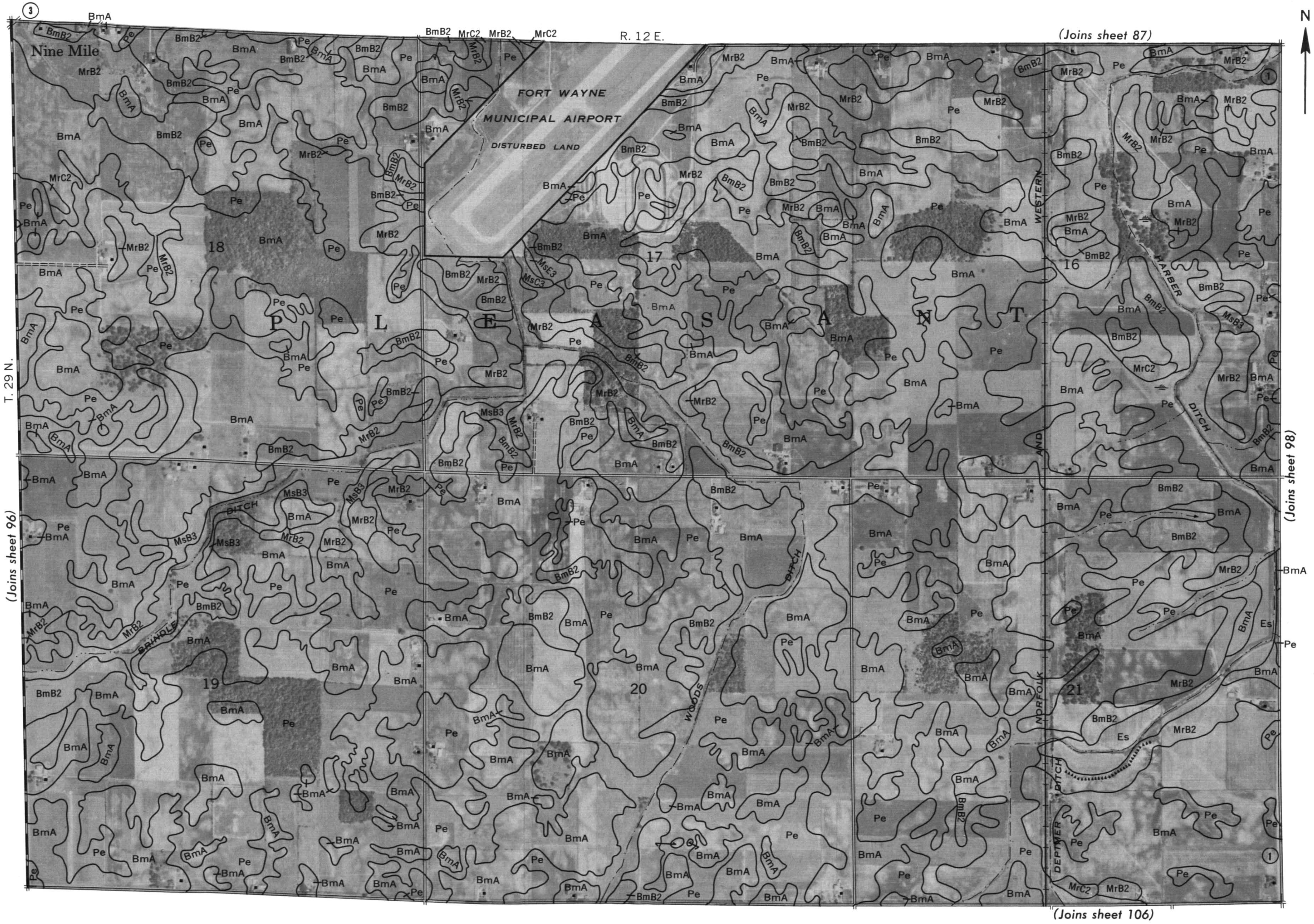
ALLEN COUNTY, INDIANA NO. 95



0 ½ Mile Scale 1:15 840 0 3000 Feet



0 ½ Mile Scale 1:15 840 0 3000 Feet

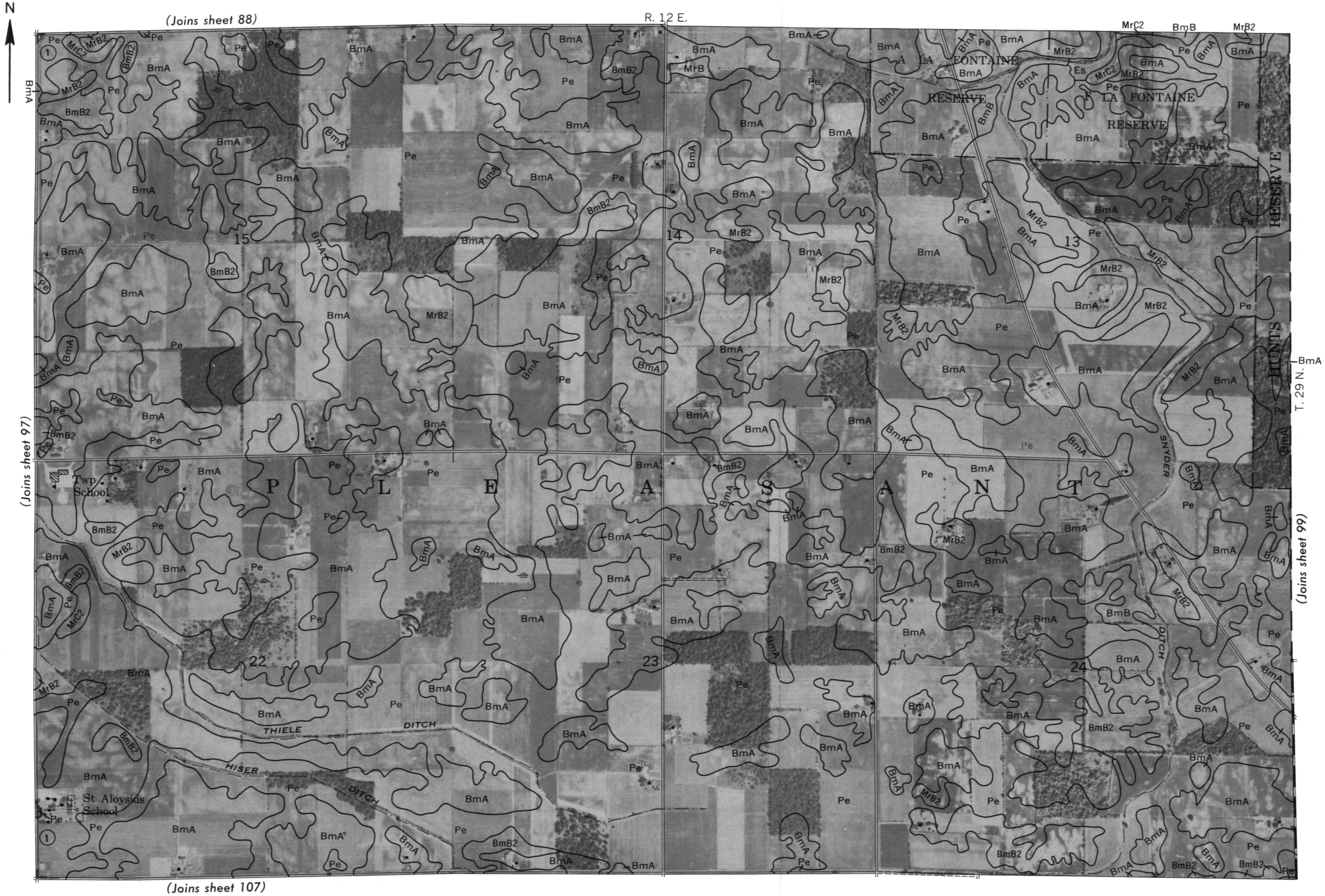


0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 97

ALLEN COUNTY, INDIANA — SHEET NUMBER 98



0 ½ Mile Scale 1:15 840 0 3000 Feet

0 ½ Mile Scale 1:15 840 0 3000 Feet

This map is one of a set compiled in 1967 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Purdue University Agricultural Experiment Station.
Land division corners are approximately positioned on this map.

ALLEN COUNTY, INDIANA NO. 99